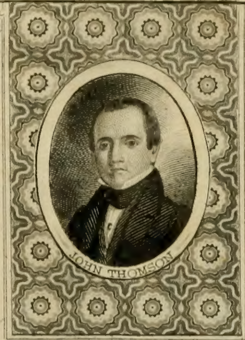
Everett pinx. C. Pelton Sc.

Samuel Thomson.

His System and practice Originating with Himself.

Born Feb. 9th 1769.

THOMSON'S PATENT.



This may Certify that I have received of Daniel Allyn Dollars in full for the ______ right of preparing and using the System of Medical Practice secured to Samuel Thomson by Letters Patent and he is thus constituted a member of the Thomsonian Friendly Botanic Society and is entitled to participate in its privileges.

Dated Geddes March 21 1844

Cyrus Thomson Agent.

E. Balch sc. Alby

THE

THOMSONIAN MATERIA MEDICA,

OR

BOTANIC FAMILY PHYSICIAN:

COMPRISING

A PHILOSOPHICAL THEORY,

THE

NATURAL ORGANIZATION AND ASSUMED PRINCIPLES

OF

ANIMAL AND VEGETABLE LIFE:

TO WHICH ARE ADDED THE

DESCRIPTION OF PLANTS AND THEIR VARIOUS COMPOUNDS:

TOGETHER WITH

PRACTICAL ILLUSTRATIONS,

INCLUDING MUCH OTHER USEFUL MATTER.

WITH PLATES.

BY SAMUEL THOMSON.

"See thyself reflected here."

"He that wishes to be counted among the benefactors of posterity, must add by his own toil, to the acquisition of his ancestors."—*Rambler.*

TWELFTH EDITION,

ENLARGED, CORRECTED, REVISED AND IMPROVED.

ALBANY:

PRINTED BY J. MUNSELL, STATE STREET.

1841.

TO BENJAMIN WATERHOUSE, M. D. LL. D.

FELLOW OF THE MEDICAL SOCIETY, LONDON;

AND OF BATH AND MANCHESTER, ENGLAND:

OF THE ACADEMY OF ARTS AND SCIENCES, BELLES-LETTRES, INSCRIPTIONS AND COMMERCE, MARSEILLES;

AND OF THE NATIONAL MEDICAL SCHOOL OF FRANCE:

FELLOW OF THE AMERICAN ACADEMY OF ARTS AND SCIENCES:

OF THE PHILOSOPHICAL SOCIETY OF PHILADELPHIA;

AND PROFESSOR OF THE THEORY AND PRACTICE OF PHYSIC IN THE UNIVERSITY OF CAMBRIDGE, MASSACHUSETTS, IN THE UNITED STATES OF NORTH AMERICA;

AS A MARK OF RESPECT FOR HIS PRIVATE CHARACTER,

PROFESSIONAL KNOWLEDGE,

INDEPENDENCE IN GIVING COUNTENANCE TO THE TRUTH,

AND MEDICAL FACTS, WITHOUT REGARD TO EARLY EDUCATION,

OR PROFESSIONAL PREJUDICES;

INVESTIGATING THE PRINCIPLES, ADVOCATING THE PRACTICE,

WITHOUT REFERENCE TO POPULAR OPINION;

AND FOR OTHER KIND OFFICES AND SUGGESTIONS,

THIS WORK IS MOST RESPECTFULLY DEDICATED,

BY

THE AUTHOR.

TO THE READER.

In compiling, condensing, collecting, re-writing and composing matter for the present work, it has been the principal object of the subscriber to present many additional facts, to strengthen and make more steadfast if possible, that which was immovable before—the system and medical practice discovered by his father, which has acquired standing and reputation for the time, unparalleled in the annals of the world. All previous systems of medicine, like the dew of the morning, when investigated under the sun-light of science, have vanished into thin air, to give place to another theory, yet to be still overthrown in its turn, by some future ambitious aspirant after a medical reputation. The more such theories are investigated and compared with truth and reason, the more rapidly they go to decay. Where are the theories of Paracelsus, Cullen, Brown, Rush, and many others of like reputation in their day? Alas for the instability of the inventions of men, that are not founded in truth and experience! They are among the things that were! The closer the investigation, the less confidence in the principles laid down. Not so with the system of practice of Samuel Thomson. The closer the criticism the more confidence in its utllity. Or like silver, the more it is burnished the brighter it shines. For those who examine it become its permanent friends. In this case there is no drawback, and all, in time, must become Thomsonians. Hence the certainty of its durability to the latest generations. Doct. Samuel Thomson has the solid satisfaction of knowing that he has established for himself, by his system of practice, a monument in the hearts of the people more durable than marble, and more valuable than precious metals.

Whatever inaccuracies or errors may appear in this work, in relation to the Thomsonian theory or practice, I assume; knowing as I do my inability to do the work that justice, which the nature and importance of the subject requires. But for the want of a more experienced person, I with diffidence, attempt to do justice to a work that requires a gigantic mind to perform. My method of arriving at facts may appear crude and undigested to many minds, but my object has been to get at the facts in that way, and manner, in which I could make myself best understood—whether by *comparison*, *anecdote* or *fable*. And therefore we are in hopes that the *matter*, and not the *manner*, will be the guiding star to the reader. We desire, therefore, that our motives may be duly appreciated, and our errors excused, as emanating from an honest intention to do justice to the name of a *venerable* parent, who has cast into the general fund his *mite* for the *health, peace, comfort* and *happiness* of future generations.

Albany, January, 1841. JOHN THOMSON.

Key to the Arrangement of this Work.

THE ELEMENTARY PRINCIPLES OF THE HUMAN SYSTEM.

DIRECTIONS TO AGENTS.

In filling out a certificate for a family right, where the individual makes his first purchase of one, the price is invariably *twenty dollars*,—and the blank should be made out as follows:—" Received of A B, *twenty dollars*, in full for the *first right* of preparing and using," &c. But if the individual has legitimately purchased one of the old rights of a regular constituted agent, and has not disposed of it again, he is entitled to one of this edition by paying *ten dollars*, and giving up his *old certificate* to the agent. Then his certificate should be made out,—" Received of A B, *ten dollars*, in full for the *second right* of preparing and using," &c. J. T.

ILLUSTRATIONS.

FRONTING TITLE.

ON ANATOMY.

OSTEOLOGY.

ON THE VISCERA OF THE BODY, AS ORGANIZED.

ON THE VISCERA OF THE BODY, SEPARATELY.

ANATOMY OF THE FŒTUS.

ILLUSTRATIONS OF PLANTS.

ERRATA.

In page 308, for prostRATE read pros*tate* gland. Some other typographical errors, &c., have occurred: but they are probably unimportant, and may be corrected by the reader.

GENERAL INTRODUCTION.

To "*become all things to all men*," as St. Paul said, may be appropriately applied to the Thomsonian Practitioner; because in order to gain the confidence of the people, we must satisfy them, that there are virtues in our medicines and truth in our practice. To attain that object, *we must* "*be wise as serpents, and harmless as doves.*"

How much has been lost to the Thomsonian practice, by the attempts of those who had full confidence in it, to convince others of the correctness of their opinions, before the mind was ripe for the conviction. For instance, a man who has had his mind and habits formed in a family where the regular practice has always been employed for the benefit of its inmates, is very scrupulous of any innovation upon that theory. If a Thomsonian says to him, the calomel and opium which your doctor applies to the use of the sick are poisons, and not to be administered, the mind of man at once, and without regard to the reasoning upon the subject, refers back and enquires, who ought to know best, the doctor, who has studied the human system anatomically, physiologically, and the theory and practice of medicine, or this Thomsonian, who knows nothing about the subject, except what he has learned from Samuel Thomson's book, which is of recent origin, and very doubtful as to the correctness of the principles laid down. The natural conclusion is, then, that it is impossible to reason with such people so satisfactorily as for them to be willing to employ a Thomsonian when sick. They may talk and reason like rational men while in health, but the moment the hand of disease is laid upon them, they seem to say by their actions this is no time to try experiments, and go for the old physician. He comes and commences his attendance as usual. The arguments of the botanic physician are fresh in his mind; he watches narrowly the operations, and the *rationale* of the medicine given by the doctor, and compares the arguments of the

two individuals. And notwithstanding, the Thomsonian may have the best of the argument, he overcomes this obstruction by the anatomical and physiological knowledge of the doctor, without once asking himself this question, is it absolutely necessary that a physician should know the name of every bone of the foot, and every muscle of the arm, to be able to relieve pain in the bowels? If that were necessary, the remedies of the aborigines of our country, and the valuable services of our venerable and worthy matrons in time of sickness, have been given to the wind. But fortunately this is not the case. Who does not know the value of the attention paid by good nurses in time of sickness? also the many cures effected by them, as well as the most ignorant aborigines of our country, after the skill of these beautiful theorists (the doctors,) have failed?

The doctor continues his attentions. He, vulgarly speaking, builds up with one hand, and pulls down with the other; or in other words, he gives soup to day, and poisons to-morrow. One to kill a little, and the other to heal a little. But generally, the poisons get the best of the bargain, as the patient gradually sinks under the treatment, and at length is not expected to live. Yet after all these symptoms of death staring him in the face, the man cannot give up the bugbear, if so you please to call it, that a knowledge of every bone and muscle in the body, is necessary to constitute a good physician. And upon this last hope, he will cling until the doctor pronounces him incurable; or that the patient from the almost certainty of death, breaks the bonds of his superstition, and says, I must die as I am, and I can but die if I send for the botanic physician. This is a fair specimen of the manner in which the Thomsonian practitioners generally first obtain employment. Now the new doctor has a chance to prove his *theory* by his *practice*, and what is still better for the patient, the doctor has no knowledge of the regular theory and practice of medicine, nor of anatomy, or surgery, under which to shield his mal-practice as a physician. And if his practice is bad, he cannot arrogate to himself the Latin or Greek names of his remedies, as well as the names of the different functions of the body, which he has learned of others, and which he uses as a shield to screen himself and his quackery from public indignation, as his predecessor has done. In this state of the facts, the fable of truth and falsehood is very appropriate. These two worthies being on a journey together, came to a river,

Falsehood wished Truth to divest himself and try the stream; unsuspecting as usual, Truth threw off his clothes and swam the river, and Falsehood, as was natural for him, took the advantage of Truth's honesty, and clad himself in his garments, under which Falsehood to this day, assumes the robes of Truth, Honesty, and Righteousness, to play off his villiany upon the world. While unsuspecting Truth has nothing to conceal, he repudiates Greek, Latin, and every other dead language that may tend to confuse or embarrass the free communication of his frank, unsophisticated ideas, in the plainest possible manner, for the benefit of mankind. In these two different lights, I place the regular and irregular practitioner. One depending upon his theory of poisons, with his shield of technicalities behind which to screen himself, when Honesty wishes to examine his hydra-head and other deformities. While the plain unassuming Thomsonian takes his remedies in one hand, confidence in the other, and truth for his shield, grapples with the hydra; and with these Herculean clubs, we see the heads of the monster dropping daily. The patient is assured of one thing that consoles him; that is, he is not taking poisons for medicines, consequently, he is in no danger in that respect. But the next thing is, does the name of the doctor, or his Greek and Latin names, alter the qualities of his medicines? Is not arsenic ratsbane? And is not ratsbane poison? And will not this poison kill if administered in sufficient quantities by either a wise man or a fool? So we may ask of mercury, antimony, saltpetre, and every other deadly article, used in the long catalogue of mineral and vegetable poisons in the regular materia medica. Now can the diploma, or the high medical attainments of any man, alter the poisonous qualities of these articles, which are poisons by nature? Or, could the ignorance of the Thomsonian be so great as to make red raspberry, witch hazel or peach leaves poisonous, when in themselves naturally they are innocent substances? Who believes that any man, because he can talk Latin, has the power to metamorphose an article that is naturally poisonous, into an innocent medicine? Or on the other hand, can the fool convert an innocent vegetable substance into a poison, because he does not understand the dead languages? No, it is impossible that the abilities of the man, either natural or acquired, should alter the qualities of the substances which God by nature has placed upon this terrestrial ball for either good or evil. The ra-

tional conclusion then is, poison is poison, and harmless medicines are harmless in whatever state they may be found; and that the different hands do not alter the qualities of the articles that pass through them.

The fact is irresistable then, that the dead languages for the practitioner, unexplained to the sick, are unnecessary; and that the honest physician will never use them to deceive, with regard to the articles of medicine he may be giving to his patient. Would it not be attended with much less trouble for the physician, to induce his patient to take a dose of *conium maculatum*, or *datura stramonium*, than if he should frankly say, I wish to give you a dose of the *poinson hemlock*, or of the *thorn apple*, both of which are well known to be potent poisons? It certainly would be. We take many things in ignorance that we would not have taken with full knowledge of their properties. And for the want of correct knowledge in relation to medicine, the sick man is compelled to risk his life many times, where he would not risk a shilling in like chances for loss, in the ordinary transactions of life.

It takes much longer for the student to make his shield, or to learn the Latin names in anatomy, physiology, and the theory and practice of medicine, in order to deceive the people successfully, than to learn all the medical compounds used in the regular materia medica!

The Thomsonian's shield, is the confidence in his system and practice, and the curing of his patients after the regulars have pronounced them incurable. Here is the true definition of quackery made manifest to every intelliobserver. One boasts of his acquirements, his book knowledge, and his diploma; while the other modestly shows you his patients in health, after having taken them from the hands of this man of science.

The Thomsonian, it is true, labors under many disadvantages. He is not popular, because the regular physicians who are now in the ascendant in public opinion, not only throw upon them the full weight of their disapprobation, but enlist that of all their friends. And having the advantages of Greek and Latin names at hand, they can always throw a veil over their bad practice, or any inconsistencies that may arise in argument, by retreating behind this shield. In this manner they force themselves along upon their assumed knowledge, every body admitting them to be learned and skillful, because they do not understand

the medical phraseology which they use, and which is as likely to be wrong as right, in many instances.

The Thomsonian is required to give a rational account of himself, to the understanding of those with whom he reasons, divested of all technicalities, and by this means his theory is discussed, his medicines analyzed, the consistency of his practice criticised, and the summing up is comparing his theory and practice together, and then casting about to see how many he has killed, and how many cured, and whether he has been as successful as the neighboring physicians.

The question is frequently asked, why do you not require your practitioners to be better qualified to practice medicine? Or, why dont you get more reputable persons to take hold of your practice, and elevate it in the scale of popular opinion? To which we reply, those we would like for practitioners have generally other business, and those who have not ambition to seek business for themselves, we certainly do not want. There are three classes of individuals who would become Thomsonian physicians. The first, and best class, are those who have been restored to health from the last stage of disease, by the use of this medicine. They know practically the operations of the medicines upon themselves, and their experience in its use, gives them confidence to apply it in other cases. From ill health, they have generally become broken down, or bankrupts, as to property and business—the doctor taking what little property they may have had, the new doctor finds the patient not only pennyless, but broken down in constitution, and run out in credit. Therefore the doctor must take him upon the strength of his promise to pay when he recovers, or lose what he does for him. If he restores the patient to health, and he has no other business, he generally commences practice upon the fund of practical or empirical knowledge, which he may have acquired in his own case, while taking medicine; and his practice is generally successful, in proportion as he has had perseverance and judgment, in the business in which he was engaged before he was taken sick. This is the only way we can form an opinion of the person's fitness for a practitioner of medicine. If he is a man of common sense in ordinary business, he will be that also in the capacity of a doctor.

The second is, the broken down merchant, manufacturer or mechanic, who is out of employ, and casting about in

his mind for the business by which he can obtain a living with the least capital. He sees that the Thomsonians have plenty of business, with good success attending the patients, and as it requires but a small capital to commence with, his mind is made up at once to become a Thomsonian. This man, like the regular physicians, must acquire his knowledge by reading the theory, and commence his practice by what he has read, and not by experience upon himself, as the other has. And like the theorist who has read books upon agriculture, he is not so safe a man to take charge of a farm as if he had touched the work by the hand of experience. While he who has been restored, by the use of the medicine upon himself, can enter into every little minutiæ of sympathy and feeling with his patients, and can increase or diminish his medicines, or discontinue them altogether, as he may think the state of his patient corresponded with his own, when sick. In fact, there are a thousand little things, where the experienced man may render his patient comfortable, that the inexperienced would not think of. Therefore, as life, health and happiness are made up of particles of comfort, we should seek them wherever they are most likely to be found ; and that is, from the fountain of long experience. On which account, we prefer the man who has obtained his knowledge or theory by his practice, instead of him who has obtained his theory before his practice.

The third class, and worst of all, are those who are destitute entirely of the ingredients necessary to constitute a man of business of any kind. These poor objects, being dregs on hand, their parents would gladly rid themselves of the dolts. They generally live for a day, and die out for want of business, and return like spurious coin to him that first issued it, to lay on hand until another occasion offers to try its currency. Many of this class we see filling reputable stations, entirely upon their acquired abilities and the respectability and wealth of their friends, without regard to their own natural talents. But they will not do for Thomsonians. For in that case, nature must have a hand in the work to give them common sense at least. Again, it is asked, why do not the respectable and wealthy have their sons study our practice, if a person can acquire a knowledge of it so soon, and the practitioner becomes so successful in restoring the sick to health? To which I reply, did you ever see the son of a rich and respectable

person, but what was designed by his parents to be made a great and popular man?

Those people who have become wealthy from indigent circumstances, would have us believe that they were never poor, consequently would not demean their sons by educating them for botanic physicians. They are destined for the law, physic, or divinity. Do you think such gentlemen would suffer their sons to adopt a profession that is so unpopular? Impossible! So you see we are obliged to take such as we can obtain, instead of such as we would have.

Under all these circumstances, who can look upon the prosperity of the Thomsonian practice of medicine at the present day without admiration—spread as it has from Mexico to Canada, and from the sea shore back to the Pacific, also in Europe and South America, originating with the illiterate New-Hampshire farmer, less than fifty years since.

The mind that can conceive, and put into execution, so gigantic a scheme, and have perseverance sufficient to buffet the torrent of opposition, which has been arrayed against Samuel Thomson, evinces that true nobility of character which was ever Napoleon's criterion while selecting his military family. Marshal Soult was taken from the ranks on account of his merit; and who does not know his military success and reputation? Said Napoleon, "*behold my right arm*," having reference to Soult as a military man. Lord Walpole believed true nobility of character comes by wealth, and favor from the crown. With such sentiments and opinions, he saw, with jealousy, the laurels that were falling so abundantly upon the brow of Doct. Franklin the American printer, while in England. And he thought on one occasion at least, he would gratify his caprice at the Doctor's expense and mortification, by exposing to the multitude the low cast or grade from which the Doctor originated. So when the greatest number of lords and noblemen were paying their respectful attention to the Doctor, while explaining his scientific theories: says the noble lord, Doct. Franklin I understand you were brought up in a *soap and tallow chandler's factory*: to which the Doctor smiled, bowed respectfully, and replied, I was sir, and I think if you had been, you would have been there now.

So we see, 'the race is not always to the swift, nor yet the battle to the strong, but to those who hold out to the end of the race,' in doing good to their fellow beings, re-

gardless of the persecution and opposition which they may have to encounter for the sake of truth.

JOHN THOMSON.

NOTE.—To assist us in the progression of this work, upon animal and vegetable life, we have consulted Hippocrates, Galen, Bacon, Bœrhaave, Sylvius, Cullen, Brown, Hunter, Goldsmith, Darwin, *Thomson*, Waterhouse, Blane, Mitchell, Hearsey, Robinson, Ingalls, Eaton, Tully, Barton, Rush, and various other authors; *for the theory and practice or the adaptation of animal and vegetable substances to sustain life, or vitality in animal matter,* SAMUEL THOMSON. J. T.

THE THOMSONIAN THEORY.

"What is Man?"

In publishing a new edition of the Thomsonian System of Practice we shall add many improvements and new remedies. We have also thought that a philosophical theory would be acceptable to all who might wish to adopt our practice. We have accordingly put our views before our readers, and leave the subject for them to accept or reject as circumstances may dictate.

In the first place, why is here a new system of medicine springing into existence so opposite to the principles of the long established and popular systems of the present age? I answer, that it was by the failure of this long established practice to restore those to health whom we are accustomed to cherish above all other earthly objects; that the mind was led into the wide region of philosophy, unguided by any human theory except reason and common sense. My father's family had been much subject to sickness, and he was anxious to have the best medical attendance in his vicinity; and he actually induced the best physician residing within several miles, to remove and locate himself upon his farm. And while a resident upon the farm, and within the space of a few years, five different members of his family had been pronounced by the doctor as incurable; and when the patient had been thus abandoned, my father was stimulated to try what he could do to mitigate or alleviate the sufferings of the patient, and happily succeded in restoring every individual to health. He then thought if this long established system of medicine, failed to restore the different members of his family to health, and he must then commence and do for them what was expected of those who have the credit of superior skill, was not his treatment the best? From that time forward, which is now near fifty years, he has never employed a regular physician. The neighbors who were called together, as is usual in country neighborhoods in time of sickness, and more especially, when the sick were supposed dangerous, were led to notice the least change that took place with the patient; and observing the happy effects of my father's nursing upon the members of his own family, became the first messengers to herald the Thomsonian system of practice to the world. In

the course of time, many of the relations or friends of those neighbors were stricken down by the hand of disease; and the physicians being employed as usual, as the best judges of the appropriate remedies for the sick, as in the case of his family, in many instances, gave over the patient as incurable. The human mind now being upon the rack for a remedy that would in the least mitigate the pains of the sufferer, it would flash upon the mind, why not send for Samuel Thomson and have him nurse the patient in his peculiar way, as he does those of his own family. This course was usually adopted, and Samuel Thomson never lost a patient to the knowledge of the writer, in his own neighborhood.

Thus my father's plan of nursing was adopted by his near neighbors, and from them it was promulgated from house to house, from town to town, and from state to state, until now it is known and extensively practiced in every state in the Union. It was by the philosophical experiments upon those who were abandoned as incurable, and the happy results attendant upon the same, that first reminded him of the language of the poet who said, "*the proper study of mankind is man.*"

Having been thus successful in nursing, he was led to inquire upon what principles the animal functions were brought into action; and by what agency they ceased to act. The practical operation of his medicines was narrowly investigated; and a reason for the specific operation of each article upon the system, required. He at last settled down upon the principle, that the human system was a species of animal machine, subject to the action of the elements, and when disordered, was to be put in order by a judicious temperament of the same elements by a competent repairer, whose duty it is to know *particularly* the principles by which the machine is deranged; and by understanding the deficiency, may know how to restore the absent power in all cases, where the principle of life is not so far gone as not to leave sufficient to build upon, or the machine is so far decayed as to be beyond restoration.

For example; the fœtus* is formed by nature with all those

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* *The best description of the* CONCEPTION, PROGRESSION *and* FINAL CONSUMMATION *of* ANIMAL ORGANIZATION, *and the* VITALITY *which constitutes the* PERFECT MAN, *can be better comprehended by a description of a hen's egg; with the* HISTORY *of the* GROWTH OF THE DIFFERENT FUNCTIONS OF THE ANIMAL WITH WHICH IT IS INHABITED. *This is as far as God in his wisdom has permitted* INQUISITIVE *man, by* OCCULAR *demonstration, to penetrate the* VEIL.

Immediately under the shell, lies the common membrane or skin, which lines it on the inside, adhering closely to it every where, except at the broad end, where a little cavity is left, that is *filled with air:* which increases as the animal grows larger. Under this membrane are contained *two whites*, though seeming to us to be only *one;* each wrapped up in a membrane of its own, one white within the other. They differ from each other in specific gravity. In the midst of all is the *yolk*, wrapt round likewise with its own membrane. At

little intricacies of machinery, that are designed for usefulness in life, viz: the organs of respiration, digestion, the nervous and arterial systems, &c. But in its present state, the mother's breath, food and beverage, and other support, is that of the child. Its birth changes the scene; the child then acts for itself; it changes a temperature of about 98 degrees of Fahrenheit, for one of from 65 to 80 degrees. The moment this low temperature strikes the surface, the outward warmth is checked, or re-

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each end of this are two ligaments, called *chalazæ*, which are white dense substances, made from the membranes, and serving to keep the white and the yolk in their places. They are called chalazæ from their resemblance to hail.

The *cicatricula* is the part where the animal first begins to shew signs of life; it resembles a vetch or small pea, lying on one side of the yolk and within its membranes. The outer membranes and ligaments preserve the fluids in their proper places, the white serves as nourishment; and the yolk with its membranes after a time, becomes a part of the chicken's body. This is the description of the *hen's egg*, and answers to all others, how large or how small soever.

Previously to putting the eggs to the hen, *Malpighi* and *Haller* first examined this cicatricula, which they consider as the most important part of the egg. This, which some call the *punctum saliens* or *punctum vitæ*, was found in those that were impregnated by the male to be large, but in others small. Upon examination with the microscope it was found to be a kind of bag, containing a transparent liquor, in the midst of which the *embryo* was seen. The embryo resembled a composition of little threads, which the warmth of future incubations tended to enlarge.

Upon placing the egg in a proper warmth, after six hours the *vital speck* begins to dilate like the pupil of the eye. The head of the chicken is distinctly seen, with the back-bone something resembling a tadpole floating in its ambient fluid, but as yet seeming to assume none of the functions of animal life. About six hours more the little animal is seen more distinctly; the head becomes more plainly visible, and the vertebræ of the back become more easily perceivable. All these signs of preparation for life are increased in six hours more; and, at the end of twenty-four, the ribs begin to take their places, the neck begins to lengthen, and the head to turn to one side.

At this time, the fluids in the egg seem to have changed places; the yolk which was before in the centre of the shell, approaches nearer the broad end. The watery part of the white is diminished, the grosser part sinks to the small end; and the little animal appears to turn towards the part of the broad end in which a cavity has been described, and with its yolk seems to adhere to the membrane there.

At the end of forty hours, the great work of life seems fairly begun, and the animal plainly appears to move; the backbone thickens; the first rudiments of the eyes begin to appear; the heart beats, and the blood begins already to circulate. The parts, however, as yet are fluid; but, by degrees, become more and more tenacious. At the end of two days, the liquor in which the chicken swims, seems to increase; the head appears with two little bladders in place of eyes; the heart beats in the manner of every embryo where the blood does not circulate through the lungs. In about fourteen hours after this, the chicken is grown more strong; the veins and arteries begin to branch, in order to form the brains; and the spinal marrow is seen stretching along the backbone. In three days the whole body of the chicken appears bent; the head with its two eye-balls, with their different humors, now distinctly appear; and five other vesicles are seen, which soon unite to form the rudiments of the brain. The outlines also of the thighs, and wings, begin to be seen, and the body begins to gather flesh. At the end of the fourth day, the vesicles that go to form the brain approach each other; the wings and thighs appear more solid; the whole body is covered with a jelly like

duced, having the same effect as the immersion in water of the same temperature. The atmospheric pressure being near 16 lbs. weight to the square inch, presses in upon the lungs, or organs of respiration, and they are at once inflated. The temperature being so much greater upon the lungs, (say 98°) than upon the surface (from 65 to 80°) that the inward warmth immediately rarifies the air to nearly the temperature of the blood; by which it becomes so light and expanded that the external pressure will not admit of its continuing longer upon the lungs; and,

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flesh; the heart that was hitherto exposed, is now covered up within the body, by a very thin transparent membrane; and at the same time, the umbilical vessels, that unite the animal to the yolk, now appear to come forth from the abdomen. After the fifth and sixth days the vessels of the brain begin to be covered over; the wings and the thighs lengthen; the belly is closed up, and turned; the liver is seen within it, very distinctly, not yet grown red, but of a dusky white; both the ventricles of the heart are discerned, as if they were two separate hearts, beating distinctly; the whole body of the animal is covered over, and the traces of the incipient feathers are already to be seen. The seventh day the head appears very large; the brain is entirely covered over; the bill begins to appear betwixt the eyes, and the wings, the thighs, and the legs, have acquired their perfect figure. Hitherto, however, the animal appears as if it had two bodies; the yolk is joined to it by the umbilical vessel that comes from the belly; and is furnished with its vessels, through which the blood circulates, as through the rest of the body of the chicken, making a bulk greater than that of the animal itself. But towards the end of incubation, the umbilical vessel shortens the yolk, and with it the intestines are thrust up into the body of the chicken by the action of the muscles of the belly, and the two bodies are thus formed into one. During this state all the organs are found to perform their secretions; the bile is found to be separated, as in grown animals; but it is transparent, and without bitterness; the chicken then also appears to have lungs. On the tenth, the muscles of the wings appear, and the feathers begin to push out. On the eleventh, the heart which hitherto had appeared divided, begins to unite, the arteries which belong to it, join into it, like the fingers into the palm of the hand. All these appearances come more into view, because the fluids the vessels had hitherto secreted, were more transparent; but as the color of the fluids deepen, their operations and circulations are more distinctly seen. As the animal thus, by the eleventh day, completely formed, begins to gather strength, it becomes more uneasy in its situation, and exerts its animal powers with increasing force.

For some time before it is able to break the shell in which it is imprisoned, it is heard to *chirrup*, receiving a *sufficient quantity of air for this purpose*, from that cavity which lies between the membrane and the shell, and which must contain air to resist the external pressure. At length, upon the 20th day, in some birds sooner, and later in others, the enclosed animal breaks the shell within which it has been confined, with its beak; and by repeated efforts, at last procures its enlargement.

From this history we perceive that those parts which are most conducive to life, are the first that are begun; the head and the backbone, which no doubt enclose the brain and the spinal marrow, though both are too limpid to be discerned, are the first that are seen to exist; the beating of the heart is seen soon after; the less noble parts seem to spring from these, the wings, the thighs, the feet, and lastly the bill. The resemblance between the beginning animal in the egg, and the embryo in the womb, is very striking. An egg may be considered as a womb, detached from the body of the parent animal, in which the embryo is but just beginning to be formed. It may be regarded as a kind of incomplete delivery. The similitude between the egg and the embryo in the womb has induced many to assert (and with great probability) that all animals are produced from eggs.

the air* by its expansion and buoyancy acquired from the internal warmth, seeks its equilibrium by rising in consequence of the heavy external pressure upon the region of the chest, which ejects it from the lungs, and with it the first sound of the voice, is a cry. This is the first movement of the machine in producing sound, which by cultivation is made to express every passion, and emotion, and want, both of the body and the mind. A judicious practitioner of medicine, is the proper repairer of this machine. To keep it in active operation until it wears out in old age, every wheel having borne its proportion of labor.

This frail bark being thrown into life, and he that modeled

* *Respiration* is the scientific name of the process of breathing, or drawing air into the lungs, and expelling it again. A full grown person, who respires 20 times in a minute, inhales each time 40 cubic inches of air, which is 48,000 solid inches in an hour, or 1,152,000 cubic inches in a day: a quantity equal to nearly 70 hogsheads.

The room in which I sit, is a chamber of modern size, say 15 feet square, and 7½ high. At the above rate, a person would respire once over, all the air in it, in about 2½ days; or twelve persons, in five hours. But twelve persons cannot breathe in a *close* room with safety, till the air has all been breathed once over. The whole becomes in a degree impure from mixture, long before. Besides, the bad air is heavier than other air, and is most abundant in the lower part of the room.

I have seen many a school-room, not larger than this, with forty children in it. If shut up closely, and the room air tight, I think they would breathe the whole over, as high as their heads, in about forty minutes. It happens, however, that rooms—school-rooms especially—are not thus air tight.

Atmospheric air is supposed to contain 21 parts of oxygen to 79 parts of nitrogen; and in proportion as either of these principles is increased or diminished, the air becomes more or less unfit for respiration. Heat, that subtle agent in nature, by its powers of penetration, rarifies the air within its influence, so as to cause it to ascend, and the cold or dense air, presses in to supply its place. So there is, or should be, a perpetual motion in this elastic fluid. But when it is confined, in a tight room, continually receiving heat from a stove, furnace or fire-place, and rarified by the heat, the warm or light air cannot make its escape, neither is there as free access of cool or fresh air by which the body may be continually kept pure. After a room has been thus enclosed till all the air in it becomes heated, let a person enter it, and he immediately experiences symptoms of suffocation; and if a door be left partly open, he may observe a current of air forcing its way out at the top of the door, and a pouring in at the bottom. It is the rarified air that passes out of the room, and the pure cool air, that seeks admittance.

One reason why heated air gives suffocating feelings, is because the oxygen is considerably diminished, therefore we inhale too freely of the light air, containing an undue proportion of nitrogen, which causes an unnatural distention of the lungs, closes the air vessels, and hinders the free circulation, by which means respiration soon becomes laborious and difficult.

Great precaution is necessary in regard to airing rooms where sick people are confined. The effluvia, arising from the sick-bed render the atmosphere in the room very unwholesome, both for the sick and those persons in attendance. Where opportunity affords, such rooms should be frequently ventilated. The best method is, to drop a window down from the top, when they are constructed so that it can be done conveniently, and the putrid air passes off; or when it has become very much impregnated by filth, to burn vinegar or any vegetable acid on a heated metal supplies the deficiency or oxygen, and destroys the stench. Pure, wholesome, fresh air, is of the utmost importance to the sick.

it pronounced it "very good," therefore, he does not design, that we should take away any part, more than that we should add to it; since we can do the one in a philosophical point of view, as well as the other.

The physician as the repairer, has only to remove the clogs and obstructions that retard the motion of the whole without removing any part of the machinery. For if you take away any portion of the complicated works, it is never as perfect afterwards; and you obstruct to a certain degree, the whole work the same as in any artificial machine, for instance a clock or steam-engine.

The child if healthy, commences and continues to grow; his arms, legs, body and face, are plump and full; you see no indications of old age, such as wrinkles, or loss of flesh: he comes up to youth, to manhood, or the meridian of life, which is from 25 to 35 years of age; the members of his body may now be said to have acquired their full vigor; and it may be truly said of the man, as of fruit, he is ripe. He turns the point or meridian of life from the zenith, and begins to go to decay. You will hear him remark, "I cannot do quite as much as I could once; my food does not appear to afford me that substantial support as formerly; my rest is deficient; my nerves have become tremulous; wrinkles are fast gathering in my face and hands; my limbs fall away," and why is all this decay? The man does not know: he says "I am growing old;" but that does not answer the question. The fact is, the first part that gives away is, the organs of digestion, by which the whole fabric is supported. These organs have first become blunted, and are not capable of extracting the same quantity of nourishment from a given quantity of food as before the man had attained the meridian of life, or before the fruit became ripe.

Well, under this state of things something must be done to keep up vital energy. It should be remembered that while the man was coming to maturity he was laying up in store strength of blood, size of muscle and bone, and a good store of flesh—the fuel of life. If his appetite and digestion should fail, the man would not die until his flesh is exhausted, and he becomes literally a wreck of skin and bones. For in proportion as the organs of digestion fail, the appetite is lost and the taste vitiated and gone. Nature now calls upon the stock or supply of flesh and blood, already in store, which was accumulated in early life to support the body in its decline, the same as a man who is ambitious in youth to lay up a sufficient competency for the interest to support him; but if the interest fails in giving him a good and sufficient support he must make drafts upon the principal, light or heavy as the circumstances of the case may require.

It is precisely the same with the human system. You will perceive an old gentleman far advanced in life, if he has not injured his constitution in his younger days by taking medicine,or lost any of the vigorous properties of the first or primitive stock of his blood by taking a part of it away or by weakening the same by injuring the digestion, through which the blood and from it the body receives its support, by animal or vegetable poisons, he will run gradually down. As the digestive powers fail, the drafts upon the substance of the flesh and blood are more urgent and heavy, and it is not unfrequent that we see the person at the advanced age of seventy, eighty, ninety, and even one hundred years, while apparently in his usual health, die sitting in his chair, in the field, or in the midst of his avocation, the fuel of life having become completely exhausted, or the lamp of life being drained to the very bottom, and the light become extinct for the want of oil; or nature having completely exhausted from her store house the means necessary to sustain life. Such a constitution we consider has been under the supervision of a judicious engineer or physician if you please; has been brought to maturity by proper management; has nurtured and invigorated a robust constitution, and by prudent management has laid aside for future use, a suitable quantity of the requisite material to sustain and prolong life after the person has passed the meridian to his last moment.

Thus you will perceive the Thomsonians, by understanding the above theory and practicing upon the same principles, are treating the human system philosophically. As our theory was formed from our practice, and our remedies are in harmony with life; as they will assist nature in her most depressed situations, or when there is sufficient left to build upon, and the remedies will not prove detrimental if given by the practitioner whose judgment has been matured and regulated by a scale established by extensive experience and observation by the bedside of the sick, no other standard can so readily be depended upon.

How applicable to the Thomsonian cause are the remarks of *Sir Gilbert Blane, Bart.*,* who after fifty years service in the STATE and in that of his MAJESTY'S PERSON AND FAMILY, says: "If the benefits derivable to medicine from physiological science, are so limited, from what other and better source is improvement to arise? The answer is, from *accurate observation:* in other words, from *enlightened empiricism.* It seems an abuse of words, to restrict the term *science* to physi-

* Sir GILBERT BLANE, Bart., fellow of the Royal Societies of London, Edinburgh, and Gottingen; member of the Imperial Academy of Science of St. Petersburgh; and PHYSICIAN TO THE KING.

ology and pathology, and to withhold it from those processes of the understanding, by which facts are ascertained and accumulated, and useful inferences deduced from them constituting OBSERVATION. Shall we dignify with the title of science, the absurd positions of Pitcairn, the puerile and shallow hypothesis of Boerhaave, and Silvius, and deny it to those solid and applicable truths, the fruits of chaste observation and sober experience, ascertained by those methods of induction which it was the great aim of Bacon to recommend, and his great glory to introduce as the only parent of legitimate, substantial, and useful knowledge? *On the contrary, the truth seems to be, that a higher order of intellect, a more rare and happy genius, a more correct and better tutored understanding, is required to elicit practical truths by observation, than to invent theories.*

By empiricism, is vulgarly understood that knowledge of the virtues of divers medicines, which have been ascertained by experience; as applicable to their respective maladies.

We have already more than once adverted to that profound wisdom displayed in the constitution of our mental faculties, whereby they are made responsive to the constitution of external nature, in the same manner as our senses, and that this is strikingly exemplified by the susceptibility of the human mind to those associations and habits which arise out of the repetition of events durably connected together by the constancy of the laws of nature. Unless these were indelibly imprinted, or recorded, as it were, in the mind during the early stages of our existence, life could not be maintained; all those instincts, by which we pursue what is salutary, and eschew what is noxious and dangerous, being founded on this principle. The avoiding of fire, and of precipices, the collision of hard and pointed bodies, may be quoted as examples of this. And what is called sagacity, in the adult stage of life is a sort of approach to, or imitation of this intuitive faculty; but, instead of being the immediate suggestion of nature, is acquired by cultivation, so that by practice we learn to connect cause and effect, means and end, operations which, in well turned minds, are performed with promptitude and precision, by interpreting fairly the appearance of nature, and stripping them of those adventitious fallacies, which mislead ordinary minds. In order to attain this there are required *an appropriate natural capacity, the good fortune of not having been beset with prejudices in early life, and habitual exercise in the observation of nature, a candid and ingenious disposition, an ardent love of truth, an exalted sense of duty, a large store of facts in a correct and tenacious memory, the power of combining, comparing, and discriminating these, by an intuitive glance, in the moment of applying them to the practical end in view.* This is what

is understood by the term *tact*, in English and French. From this it will be seen, how vain all acquired knowledge is without practical habits. It is evident, that, as the action of life must depend on the compound operation, and reciprocal influence of all these powers, those who propose to found practical medicine on their knowledge of the laws of life, must encounter such difficulties in estimating and ascertaining the result of them, as must appal the boldest theorist. For, as in an algebraical problem, if any one element of the calculation should be omitted, or mis-stated, the result must be erroneous; so if in taking our measures in medicine, if due weight is not assigned to each of those influences, our practical inferences must be illusory. *The knowledge of nature, in all its branches, is an indispensable requisite in the cultivation of the mind.* There is nothing better known to those, who are conversant in medical practice than that the most ignorant and shallow, those of the least learning, nay those of no learning at all, are the most addicted to hypothetical reasoning, the most infected with presumption and self-conceit. The only means, therefore of guarding ourselves from being misled by false theories, or by the misapplication of those that are true, is to gain a thorough acquaintance with both. When it is considered, what a mass of credulity and error has actually accumulated in medicine from the presumptuous attempt to grasp at such objects, and to make hasty and dangerous application of them to practice; when we cast our eyes upon our shelves, loaded with volumes, few of which contain any genuine profitable knowledge, the greater part of them composed chiefly of matter, either *nugatory, erroneous, inapplicable, or mischievous, in which the dear bought grain is to be sought in the bushel of chaff, may it not be questioned, whether such researches have not tended more to* RETARD *and* CORRUPT, *than to advance and improve practical medicine. The study of nature is surely the most salutary of all intellectual exercises in the practical arts, particularly that of medicine, inasmuch as it comprises the knowledge of the mutual agencies, about which it is conversant.*

The habitual meditation on natural causes, tends to banish superstition, and to abolish the frivolous practices riveted in ordinary minds by early impressions and imposing authorities, or sanctified by immemorial usage and tradition. It is very remarkable, that theories though widely different do often wonderfully coincide in matters of practice with each other and with well established empirical usages, *each bending and conforming in order to do homage to truth and experience.*"

Such are the natural qualifications, says the learned Doct. Blane, to constitute a judicious, and successful practitioner of

medicine. If Doct. B. had been inspired to have given a description of Samuel Thomson, his early impressions, education, natural abilities, turn of mind, promptitude and decision of character, his ability to treasure up useful knowledge in medicine, and accumulate facts, the power of comparing, combining and discriminating at a glance, at the moment, in the time of distress, he could not have entered more completely into every minutiæ and have given a more perfect picture. We are led to exclaim with the poet "*see thyself reflected here.*" If such is the opinion of a "*giant in medicine,*" in relation to *empiricism, or Thomsonism* if you please, why should Thomson regard the thousands of pigmies in intellect which are flooding the country like the locust of Egypt, or like an overgrown incubus settled upon the *peace*, *prosperity* and *happiness* of the community, and are described by Doct. Blane as follows: "There is nothing better known to those who are conversant in medical practice, than that the most ignorant and shallow, those of the least learning, nay, those of no learning at all, are the most addicted to hypothetical reasoning, the most infected with presumption and self-conceit." Who will presume that the Doctor had no correct knowledge of these facts after *fifty years* of experience in the army, navy and royal family of Great Britain?

The presumptive evidence is then that the Thomsonians have the right track. Therefore, as in nautical phrase, after having run by dead reckoning, guided only by *philosophy* and *reason*, for near fifty years, we are happy to find on comparing notes with so experienced a seaman, that our calculations agree. The latitude, longitude, bearing, and distances of the breakers and quicksands, place us both upon the same and safe ground.

Thus it is truly cheering to the weary mariner, who, after having been *beat about* by *storms* and *tempests* upon the *trackless* ocean without a guiding star from heaven, after the toils, dangers and doubts that harrass his mind have passed, to find on the first glimpse of light from the firmament, that his calculations are correct, and will compare with the most experienced seamen. He can pursue his usual course with renewed confidence that ultimately he will be crowned with success at the conclusion of the voyage. J. T.

ON VITALITY OR ANIMATION.

> " *Soul** of surrounding worlds !
> Without whose quickening glance, this cumbrous earth
> Would be a lifeless mass, inert and dead,
> And not, as now, the green abode of life."

The subject of animation is not merely curious, but leads to usefulness. It has arrested the attention of philosophers in almost every age of the world. Some of the ancients reasoned thus on it: Matter of itself cannot move, yet it is evident all things change, and that nothing is lost; the sum total of matter in the Universe remains perfectly the same; and as it was the work of OMNIPOTENCE to create something out of nothing, the same Omnipotence is required to reduce any thing back to nothing. It is apparent that there is an universal change, or mutation of all things into all, then must there be some ONE *primary matter*, common to all things out of which they were made—They went still further, and enquired into the *moving principle*, the *efficient cause*, that is to say, that *cause*, which associates, the elements of natural substances, and which employs them when associated, according to their various and peculiar characters. This moving principle they called the *Anima Mundi*, the *Soul of the World*.

THALES, one of the seven wise men of Greece, maintained, that *Water* was the subtle principle that moved all things. He concluded that matter was chiefly dealt out in moisture; that the seeds of plants so long as they are in a growing state, are moist; and that a vegetable will grow to a considerable size from water alone; that the earth is refreshed, recruited, and made fruitful by water:—that the air itself is but an expansion, or expiration of water. He reminds us of the immense quantities in the subterraneous reigns, whence fountains, and rivers, like so many veins in the body, convey water over the surface, and through the bowels of our globe, to vivify and sustain the whole.

HERACLITUS maintained a very different doctrine. He taught that *fire* was the vivifying principle of all things. He allowed the truth of *Thale's* doctrine, but observed that *fire* had such an universal sway in nature, that water itself was not without a mixture of it; for that water grows hard and congeals into ice when fire leaves it, and is only restored to its fluidity by entering it again. He remarked that the whole mass of waters in the sea, was actually an ocean of fire, seeing there were not two distinct drops of water, which do not owe their fluidity

* The sun.

to some portion of fire enclosed within them. So deeply rooted was the doctrine that fire was the first or animating principle, that there were, and still are, whole nations who worship it as a deity.*

Anaximenes contradicted both these philosophers; and contended that *Air* was the vivifying principle and first mover of all things. He observed that although the water of *Thales* could not subsist without the fire of *Heraclitus*, yet fire itself could not exist without *Air*, which was the very spirit of flame, and the breath of life: that no seed of vegetables, eggs of animals, be they ever so ripe, or pregnant, and cherished with ever so kindly a warmth, will ever bring forth the embryos contained in them, if they be totally deprived of air. We shall see hereafter the necessity of attending to these powerful agents, *fire* and *air*, in the resuscitation of those apparently dead by suspension, submersion, or frost.

Let us now examine the subject of animation with the light afforded us by more modern Philosophers.

From them we learn that matter is inert; that any one particle of matter left to itself will continue always in the same state, with regard to its motion or rest. There are, however, certain powers, which *two* particles of matter have of acting on one another, as in gravitation and cohesion. We learn also that there is an attraction of *crystallization*, by which bodies when fluid become in time solid, and assume a particular figure; that there is an attraction of *magnetism*, by which a piece of iron in certain circumstances, attracts another piece of iron; that there is an attraction of *electricity*, by which a substance charged with more electric matter flies to another charged with less. There is moreover, *chemical attraction*, by which two particles of different bodies rush together, and form one. If we add that most of these have their opposite repulsions, we can say that they are all the known properties of mere matter; and there is nothing in them that can merit the name of *vitality*.

But there is in a growing vegetable a power beyond all this, viz: a power which *first moves*, and then *conducts* that latent process by which a seed becomes a plant.

Now, every body capable of growing, has a certain internal

* That venerable sect of Philosophers, the *Stoics*, taught that there was one infinite, eternal, almighty mind, which, diffused through the whole universe of well ordered and regularly disposed matter, actuates every part of it, and is as it were the soul of this *vast body*. The parts of this body they say, are of two sorts, viz. the *Celestial*, as the planets and fixed stars: and the *Terrestrial*, as the earth, and all the other elements about it. The celestial continue without change, or variation. But the whole sublunary world, is not only liable to dissolution, but often hath been, and shall again be dissolved by *fire;* and that the reciprocal deaths, dissolutions and digestions, which support by turns all the substances which we see, are the effects of *fire*.

adjustment, disposition, or arrangement of its matter, which is called *organization;* and being capable of increasing in bulk, has a certain degree of *vitality.* There is a scale of life, stretching in uniform gradation from human excellence downwards, till it disappears in a shade of ambiguity, in the living state of vegetables. Life, says the *Bishop of Landaff*, belongs alike to both the animal and vegetable kingdom; and seems to depend on the same principle in both. Stop the motion of a fluid in an animal limb, by a strong ligature, the limb mortifies beyond the ligature and drops off; a branch of a tree, under like circumstances, grows dry and rots away. Both animals and vegetables are subject to be frost bitten and to consequent mortifications; both experience extravasation of juices from repletion, and pinings from inanition; both can suffer amputation of limbs without being deprived of life, and in a similar manner both from a callus; both are liable to contract disease by infection; both are strengthened by air and motion.

Every seed of a plant is an organized body endowed with vessels, and contains under several membranes the plant in miniature. If this seed be put into the *moist* earth and a certain degree of *heat* applied, with access of *air*, the three principles of the ancient Philosophers, the juice in these vessels will expand by the warmth; and being thus once put in motion gradually increase, and grow up into a plant; which plant produces a similar seed capable of propagating its kind forever.

In like manner, an egg is an organized body, which contains under several envelopements the chicken in miniature; and may be considered as a womb, detached from the body of the parent animal, in which the embryo is just beginning to be formed; if warmed to a certain degree, whether by the parent animal, or by art, the fluids which surround that speck in the egg called the *punctum vitæ*, expand, and the little vessels swell and extend themselves; and the motion or oscillation once began, it develops, by degrees, until it becomes a perfect animal, capable of all the functions common to its kind.

The seed of the vegetable, and the egg of the animal would remain, or rather *become* effete and inanimate, unless some stimulus, some agent *from without*, excited or began a motion in them. But what is this agent, or stimulus? For that is the question.

This stimulus, or animating principle in a natural body, does not depend on its organization, nor its figure, nor any of those inferior forms, which make up the system of its visible qualities; but it is the *power*, " which not being that organization, nor that figure, nor those qualities, is yet able to produce, to preserve, and to employ them. It is therefore the *power*, which

departing, the body ceases to live, and the members soon pass into putrefaction and decay."*

From an attentive observation of animated nature, we discover that life is caused, and continued by something which acts from without; and this something is, as far as we can discover, *heat*, acting on the seed or egg. I say *heat*, according to the common acceptation of the term: but to speak more philosophically, it is *that subtle electric fluid, which fills the immense space of the whole universe, pervades all bodies, and actuates every particle of matter. Heat* is only one effect of its motion.

In whatever manner a susceptible, or irritable body is operated upon by this exciting power, a certain quantity of it, or a certain energy, is assigned and belongs to every individual system upon the commencement of its living state.

Now a living animal has, besides those attributes common to all bodies, as solidity, extension and gravity, a *peculiar something*, which distinguishes it from a dead one; for a muscular fibre will contract, and that not by the power of gravitation, cohesion, crystallization, magnetism, or chemical attraction.

That state of an animal fibre, in which a contraction, or oscillation, is produced by the influx or contact of a stimulus, is called *irritability*, or *susceptibility*, and *excitability*.

That principle in animals, on which sensation, motion, and all the animal powers depend, is called the *Vis Vitalis*.

By the action of stimuli on the solids, particularly *heat*, the *vis vitalis* is excited and preserved; when diminished it may be increased, and *when suspended it may be restored*.

Within every one of us, there is an *innate* and *active power*, which ceases not its work, when sense and appetite are asleep; which without any conscious co-operation of the man himself, carries him from a seed or embryo, to his destined magnitude. This is strictly speaking the *Animal Œconomy*, and is as perfect in the brutal Hottentot, as in the brightest genius of human kind.

All this depends on a principle which some call the *Vis Actuosa*, others the *Impetum Faciens*. This power is *innate*, and is that by which man lives; it forms him, it nourishes him, moves him, animates him. By it he feels, he desires, refuses, sleeps and wakes; nevertheless, it is totally different from the *Mind;* For,

In our bodies is found something of quite a different nature from what has been mentioned; a power of thinking, reflecting, comparing, choosing, and representing to itself past, present and to come. This power in relation to its several operations, is termed comprehension, understanding, reason, mind,

* See page 14.

will, freedom, or collectively, by the single word Soul. But to return to the innate principle of animation in man.

Every body knows that although the child is formed, and lives, and grows, and moves in the womb of its mother, it never breathes there. It receives its animating principle, its heat, motion and life, from the mother, by a nerve and artery, which enters at its navel and conveys the blood to the heart of the infant, *without ever passing through the lungs*. The blood in this case goes directly on through the body of the heart, by an opening called the *Foramen Ovale*, and from thence to the *Aorta*, or great artery, by which it is driven to every part of its body; so that the circulation, nutrition and life, are kept up with the mother, as if they were not two bodies but one. It is remarkable that the fruit of vegetables is, in like manner, nourished, and supported by a slender stalk issuing from the parent stock.

When the child is born it becomes dependent on a *new* principle for the continuance of its existence. When it passes from the watery habitation into the atmosphere, a new determination takes place; and instead of the *umbilical cord* from the mother, the common air becomes the *main-spring* of all its actions and functions. When the child opens its mouth to cry, in rushes the air,* and expands the lungs. The blood, which had hitherto passed *through* the heart, now takes a wider circuit, and the *foramen ovale* closes forever. The lungs which had, till this time, been inactive, now first begin their functions, and they cease not their motion as long as life continues.

Hence then it appears that next to the expanding power of heat, *Respiration*, or *breathing* is the *primum mobile* in the human machine.

Atmospheric air contains a certain *vivifying spirit*, which is necessary to continue the lives of animals, and this, in a gallon of air, is said to be sufficient for one man during the space of a minute, and not much longer. Air that has lost its vivifying spirit, deadens fire, extinguishes flame, and destroys life.

It is well known that there is a set of vessels in the lungs which contain air, and another which contain blood.

The air in the lungs is in constant motion; for either that which is at present contained in the cells, is passing through the wind-pipe into the atmosphere; or a fresh parcel is passing from the external atmosphere through the windpipe into those cells. The whole of this compound motion is called *respiration*.

If the air continue at rest in the lungs for many minutes; or if a man continue to respire the same air; or if he breathe air that has served for the inflammation of fuel; or pure fixable air, or any other vapour, excepting respirable air, he dies.

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* See page 14, atmospheric pressure.

From the organs of respiration; or rather from what may be called the *systema spirituale pneumonicum*, all the actions of the body, and all the power which it exerts are ultimately derived.

It appears from a train of experiments, that the common air communicates a vivifying something to the blood, when drawn into the lungs, and gives to it a stimulating quality, by which it is fitted to excite the heart to action; and that the chemical quality, which the blood acquires in passing through the lungs, is necessary to keep up the action of the heart, and consequently the health of the animal. For no sooner are the lungs quiescent than the heart ceases to contract, the blood stops, all the intellectual operations cease, sensation and voluntary motion are suspended, and all external signs of life disappear. All which are admirably explained by Dr. *Edmund Goodwin.*

When the fluids in the human machine are thus at rest, what do we see? A mere carcase—we see the person dead.* But after what manner? Here are all the solids, and all the fluids too. What then is lacking? A gentle oscillation, or motion of the fluids, a circumgyration of the liquors; for let there be by what means soever an oscillation, a concussion, or excitement of the nervous energy, which may impel the fluids to move the lungs and heart, life immediately returns, with the usual circulation of the blood and other fluids, heat, colour, agility, *cogitation*, and every vital, natural, and human action.

If it be asked, *what is that vivifying something which, through the medium of the atmosphere, gives this oscillation or concussion, and continues life?*

I answer; *it is a portion of that subtile electric fluid, which fills the immense space of the whole universe, pervades all bodies, and actuates every particle of matter. By it the phenomena of magnetism, fire, and light are produced; and on it the various and astonishing phenomena of* VEGETATION *and* ANIMATION *depend.* If it be asked further, what and where is the source of this all powerful agent? I answer, the SUN *is the efficient cause of the motions of this fluid, and the various phenomena of our system are the effects of these motions.*

I am aware that analogical arguments are probable, but not conclusive; and that plausible inferences from well known facts in brutes, have occasioned many errors respecting man. Yet I cannot but believe from what we observe in the resuscita-

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* There are several instances of people buried alive, even in this country.

Oh reader! ———— But that I am forbid
To tell the secrets of *the* prison-house,‡
I could a tale unfold, whose lightest word
Would harrow up thy soul, freeze thy young blood,
Make thy two eyes, like stars, start from their spheres.

‡ The GRAVE.

tion of swallows, after lying four months in the bottom of a pond; of snakes frozen stiff as a stick; of flies corked up in a bottle of Madeira in Virginia, and brought to life again in Great Britain; I say, I cannot help believing from these and similar facts, that it is possible to restore to life a human being who has been frozen some days. We have well authenticated accounts of not only birds frozen to death (as it is called) but of the human species too, who were even for days, without pulse, breathing, or the least natural heat, and yet resuscitated.*

In this case, the application of heat should be conducted, says Dr. *Goodwin*, on the same plan, which nature points out for the hybernating, or torpid animal; that is to say; it should be applied gradually and uniformly. It may be raised to 98 degrees of Farenheit, but not above 100. To blow one's own breath into the lungs of another, is an absurd and pernicious practice.

The consideration of the facts just related, have led some to conceptions of the *Soul*, which have puzzled them, and created doubts rather unfavourable to the opinions entertained by the majority of christians. "What is the condition, say they, of the soul all this time."—In animal bodies there are only two general conditions, *life* and *death*; and if by *death* we understand the privation of life, there can be no intermediate state between them, says Dr Goodwin; for no human art can communicate life to *dead* matter. Dr. Whytte thinks it is not only probable, but even demonstrable, that the soul does not immediately leave the body upon a total stoppage of the heart's motion, and of the circulation of the blood, that is, upon what we usually call *death*, but that it continues for some time at least present with it, and ready to actuate it. He thinks, with Gassendi, Dr. H. More, Sir Isaac Newton, Dr. S. Clarke, and some other of the greatest philosophers of the last and present age, that the soul is extended.

The apparently dead carcase, therefore, which has lain three or four hours under water, is as much alive as a sound hen's egg; they would both putrify and dissolve if let alone; but apply a due and uniform degree of *heat* to either, and you change the *seemingly* dead body into a live and active animal.

The union of soul with body, is the most abstruse contemplation that can exercise the mind of man. "How is it that one painful idea alter the course of the blood! Who can explain how the blood in return, carries, its irregularities to the mind! What incomprehensible mechanism has subjected the organs to sentiment and thought! What, says Voltaire, is that unknown *fluid*, which is quicker and more active that light, and flies in

* See the writings of *Redi* and *Whytte*. The Flora Siberica. Also Peyer Knatom.

the twinkling of an eye, through all the channels of life; produces memory, sorrow or joy, reason or frenzy, recalls with horror what one would wish to forget, and makes of a thinking being, an object of admiration, or a subject of pity and tears!"

The intellectual scheme, says the author of *Hermes*, which never forgets DEITY, postpones every thing *corporeal* to the PRIMARY MENTAL CAUSE. It is here it looks for the origin of intelligible ideas, even of those, which exist in human capacities. For though *sensible* objects may be the destined medium, to *awaken* the dormant energies of man's understanding, yet are those energies themselves, no more contained in *sense*, than the explosion of a cannon in the spark which gave it fire.

This then, like all other sound philosophy, leads us at last, up to the GREAT FIRST CAUSE, the ENS ENTIUM, the SUPREME AUTHOR OF ALL, who is ever to be adored with the most profound reverence by the reasonable part of this creation.*

BOTANY:

OR, VEGETABLE MATTER AND ORGANIZATION.

———" Who, ere the morn of time,
On wings outstretch'd, o'er *Chaos* hung sublime;
Warm'd into life the bursting EGG of NIGHT,
And gave young Nature to admiring Light.

We shall now present our readers with a concise *History of Botany* from the earliest ages, until this Science came finished from the hands of our great master Linnæus.

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* It would seem that the *Parent of Universal Nature* has ordained, that to a certain degree of exquisite organization the soul should adhere; for between organization and function there exists a connexion proportioned and inseparable. When that subtile organization is ruined, the soul flies back again, like quenched fire, to the source whence it came. If so, then are not our bodies vessels, immersed in the vivifying spirit, the "anima mundi?" If the materials, which compose these vessels be arranged after a certain manner, life, or the spirit adheres to us. If the vessel is cracked, to a certain degree, it can hold no water. If the body be to a certain degree marred, it can hold no life. If the deranged organization banish life, for fifteen or twenty minutes, as in persons who have lain that time under water; and if, by communication of warmth, and agitation of the lungs, and of the heart, life should be restored, what shall we say then? where? and in what state was the soul, or immortal part? We can only say, that being still immersed in the anima mundi, the body is rendered, by the means used, capable of imbibing again the needful portion of that spirit in which "we live, move, and have our being." I say, imbibing *again;* for in the beginning "*He breathed into man the breath of life*, and the consequence was, "*he became a living soul.*"

We are confident that there is *something* in us that can be without us, and will be after us; what it was before us we know not; nor can we tell how it entered us.

Βοτάνη in the Greek language means an *herb*, whence is derived botany, which at this day signifies the science relating to vegetables, for which the ancients had no name; as it was not in their days erected into a regular science.

Although botany, as a science, may appear to some a study too dull for an exalted and refined genius; yet if we cast our eyes back on the earlier ages, and trace this branch of knowledge down to our own times, we shall find that it has been cultivated by those of the brightest parts, and fostered by men of great distinction. We need only mention him who is called by way of pre-eminence "*the wise man*." Though born to a throne and destined to rule over a powerful people, yet was SOLOMON so captivated with the charms of botany, that he is said in the scriptures to have known plants "*from the cedar of Lebanon to the hyssop that springeth out of the wall;*" and we find in his "book of wisdom," that he not only "*knew the diversities of plants*, but *the virtues of their roots*."

SOLOMON flourished about 170 years after the siege of Troy, or in the year of the world 2129, and is said to be the first botanist on *our* records of mankind. But on examining the oldest book we have, the Bible, we find an account of a plan for establishing a *Botanical Garden* as early a 899 years before Christ. The account of it is contained in less than three verses in the first book of Kings;—*And it came to pass, after these things, that* NABOTH, *the Jezreelite, had a vineyard, which was in Jezreel, hard by the palace of* AHAB, *king of Samaria. And* AHAB *spake unto* NABOTH, *saying, Give me thy vineyard that I may have it for* A GARDEN OF HERBS, *because it is near to my house. And* NABOTH *said to* AHAB, *God forbid!* But in order to force it from him, *they set two sons of Belial to bear witness against him, saying, Thou didst blaspheme God and the king: and they stoned him so that he died.* But divine justice, which forever pursues dishonorable and base deeds, avenged the cause of persecuted Naboth; for the dogs in the streets licked up the blood of the two principal contrivers of this plot.

We find no mention of a botanist, from the glorious SOLOMON down to the venerable father of medicine, *Hippocrates*. He gives us the names and virtues of two hundred and thirty-four plants, but no description by which we can ascertain what they were. Cotemporary with the father of physic, lived *Cratevas*, who he calls the prince of botanists. A considerable space after him appeared *Theophrastus;* who wrote ten books on plants, of which nine have reached our hands. These merit the highest encomiums.

Theophrastus was a disciple of Aristotle, and flourished in the third century: he may justly be considered as the *father of*

botany. He treats of the vegetable life; and the anatomy and construction of plants, and of their origin and propagation. He divides vegetables into seven classes, which division is founded on the generation of plants, their place of growth, their size, as trees and shrubs, their use, and their lactescence, which last circumstance respects every kind of liquor, of whatever color, that flows in great abundance from them when cut. This golden monument of botany cannot be too strongly recommended to the curious.

The Romans were devoted to Victoria; a deity so adored by that rough people, that they paid little attention to natural history. Pliny says that they were strangers to botany till Pompey conquered *Mithridates*, the most philosophic king of the age. His observations on the medicinal virtues of plants falling into the hands of Pompey, were, by his orders, translated into Latin. *Dioscorides*, though by birth a Grecian, lived under the Roman empire. He was the next botanist of note after Theophrastus. It is highly probable, that several botanists lived between the time of Theophrastus and Dioscorides, a space of nearly 400 years; yet if we except Antonius Musa, Euphorbius, and Æmilius Macer, who was a soldier, poet, and botanist, and the first who clothed botany in poetry, we find no mention of any one who paid attention to this science. Dioscorides mentions about six hundred plants; four hundred and ten of which he described, together with their medicinal virtues; about five hundred of them are mentioned by the father of botany. Dioscorides arranged plants, from their uses in medicine and domestic economy, into four classes, viz. *aromatics*, *alimentary vegetables*, *medicinal*, and *vinous;* a vague and fallacious distinction.

Pliny, in his immense compilation, called the history of the world, mentions four hundred plants more than are to be found in Dioscorides; and yet he lived but about forty years after him. He, who wishes to see all the natural history of the ancients at a glance, may consult Pliny to advantage.

The famous *Galen* flourished about 130 years after Christ. He was, for that day, a great traveler, and might have increasad the catalogue of plants; but he contented himself in descanting on the medicinal virtues of those mentioned by his predecessor.

After the sixth century, learning was almost entirely abolished by the Goths. Whilst a swarm of northern barbarians were destroying taste and learning in the western empire, the Arabians who were followers of the renowned Mahomet, over-ran the eastern. By conquering Greece, they monopolized all the writings of that famous nation. During 400 years there was no attempt to draw from its obscurity the botany of the ancients.

At length one of the Saracen califs ordered the Greek books on medicine to be translated into Arabic, or their mixed Saracen language; and botany, which is a branch of medicine, attracted their notice. Serapio collected the Greek and Arabian authors, who had written on plants; and after him followed Razis, Avicenna, Averhoes, Actuarius, and several others of less note. They were more attentive to the materia medica in general than to plants in particular. To them we owe the knowledge of sugar, of distilled spirits, of rheubarb, senna, and most of the milder cathartics.

After a dark and dismal period, emphatically styled the barbarous or dark ages, a dawn of light began to appear, first, in Italy, and from thence, a second time, over the world, when Medicine, and her hand-maid Botany, emerged from the gloom of barbarism; for in 1440 *Theodore Gaza*, a Greek refugee at Rome, resuscitated philosophy by making elegant translations of Aristotle and Theophrastus, who were commented on in the sequel by Scaliger and Stapel. Dioscorides was likewise translated into pure and beautiful Latin by a Venetian nobleman.

John Parkinson wrote his *Paradisus Terrestris* in 1629. He was apothecary to the king. The history of flowers he gave at great length. In his *Theatrum Botanicum* he has comprehended more species of plants, than were to be found in any history of plants published before his time.

Among public gardens, in which plants were demonstrated by professors, that of Padua is the oldest. It commenced about the year 1530. From that period, professors of botany have been established in almost every school of medicine.

The famous *Cosmo de Medicis* founded a botanic garden at Pisa; and committed it to the care of *Andreas Cæsalpinus*, a celebrated physician, botanist, and anatomist, the father of the botanic system and professor of botany at Padua.

Prosper Alpinus was nearly as eminent in botany as in physic. He made a large and rare collection of plants in Egypt, and afterwards read lectures on botany at Venice.

The famous *Henry the fourth* of France founded the botanic garden at Montpelier in 1598; the care of which has successively been committed to distinguished botanists, who were also physicians.

Francis the first was a great admirer of botany, and a liberal encourager of every plan that could improve and advance it.

Lewis the fourteenth founded a noble garden in the suburbs of St. Victoris at Paris, and put it under the care of *Heroard*, his chief physician, and *Guide Borossæas*, his physician in ordinary.

It is about 150 years since botanic gardens were established

in England. Those at Chelsea and Oxford are the most ancient. About the same time, botanic gardens were formed in Holland. The garden at Leyden is the most celebrated. The great *Boerhaave* was professor of botany there, at the same time that he filled Europe with his fame as a professor of physic.

Prior to this period two illustrious brothers appeared, who alone have done more for the advancement of botany, than all the rest together, who preceded and followed them, until Tournefort. Rare geniuses! says the celebrated Rousseau, whose vast knowledge and solid labors, consecrated to botany, rendered them worthy of that immortality which they have acquired. For, till this part of natural history falls into oblivion, the names of *John* and *Caspar Bauhin* will live along with it in the memory of mankind. Each of these indefatigable men, *par nobile fratrum*, undertook an universal history of plants, and to add to it a *synonymy*, or exact list of the names that every plant bore in all the writers which preceded them.

John nearly completed his undertaking in three volumes folio, but did not live to publish the whole. *Caspar* labored forty years, but the life of man is too short for the execution of a plan so extensive. Their works are still the guide to all those, who wish to consult ancient authors on botany. John Bauhin was born at Lyons in 1541, and died in 1624. Caspar was born 1560, and died 1624.

After this period, scarcely an author wrote on medicine, but wrote more or less on botany; of these we must not omit *Fuchsius*, who in 1530 published five hundred and ten figures of plants; nor *Rondeletius*, a physician of Montpelier. Nor may we forget *Turner* a learned English physician, who published the first history of plants in English, with most of the figures of Fuchsius. He gave the names of the plants in Latin, Greek, German, and French, in alphabetical order.

Hyeeronymus Bouc, a German, was the first of the moderns who has given a methodical distribution of vegetables. In his history of plants published 1532 he divides the eight hundred species there described, into three classes, founded on their qualities, habit, figure and size; *Clusius* endeavored soon after to establish the natural distinction of Theophrastus, which was into trees, shrubs, and under-shrubs. Others attempted to characterize plants by the roots, stems and leaves, but all were found insufficient.

If Natural History forms, as Lord Bacon says, *the basis of all the sciences*, it is certainly a study of the first importance. It is of more importance than even Natural Philosophy, which only aims to teach those quiescent forms of Nature, which all bodies indiscriminately possess, as extension, figure, durability,

and *vis inertia ;* whereas the natural historian describes and aims to explain the growing, or living state of organized bodies, as well as their structure after life has departed.

It is not, as they conceive merely, a dry description of that which strikes the eye only of the spectator. The Natural Historian is led to explore the origin, or primordium of organized bodies; and to trace their gradual developement to a perfect plant or animal, and to expatiate on their accretion, or growth up to their destined magnitude; and from thence to their dissolution. The naturalist treats not only of *matter*, as an elementary constituent in composite substances, which appertains in common to all bodies, but he is compelled to investigate also that *efficient cause*, or *moving principle* which associates these elements; and which employs them when associated, according to their various and peculiar characters. Within this wide view of Nature, its historian discovers, or imagines that he discovers a division of things, which he calls the THREE KINGDOMS of *Nature*, namely—the *Mineral*, the *Vegetable*, and the *Animal*. One of them only attracts our attention, at this time, viz. the Vegetable.

We wish to give to the term *Botany* a wider scope than is generally allowed to it. We would define *Botany* to be that branch of Natural History which teaches the anatomy, physiology and economy of vegetables.

We shall give our doctrine a dress partaking more of the popular, than of the scientific garb; as much of the former, as not to disguise this beautiful handmaid of Medicine; and yet not so divested of the latter, as to displease the eye of the most rigid disciple of the Linnæan school. We avow LINNÆUS to be our lawful chief; and his *Philosophia Botanica* our rallying point and standard. In acknowledging him our teacher and leader in the field of Botany, we wish to refer the learned reader to his admirable writings for the reasons of this our attachment.

Whoever casts his eyes on the surface of the earth, in June, will see that it is covered and adorned with a beautiful green carpet of vegetables, which carpet is spread anew every year. If after viewing and admiring its agreeable effect, and after reflecting on its annual renovation, the student of nature should take the pains of examining any individual plant, of which this carpet is composed, he will find that the stem, or trunk of each vegetable is not like a lump of clay, or piece of dough; but that it has an internal adjustment, arrangement, or disposition of its matter into tubes and vessels, which is called for that reason, *organization*. If he view the plant through a microscope, he will discover in it different orders of vessels, like those of an animal; and should he submit it to a careful and

nice anatomical investigation, he will be convinced that a plant posseses a vascular system. If he compares it with those things which belong to the other two kingdoms, he will see that a plant occupies a middle space between animals and minerals. On still closer examination he will find that it partakes of the nature of both. If he pluck it up by the roots, he perceives that its appearance is directly changed, for it loses its turgescency, color and specific odor; or in other words, it fades, wilts and dies, and is finally decomposed. Hence the inquirer learns that a growing plant is not only a regularly organized body, possessing a vascular system, but is, while attached to the ground by its roots, a living one. That this view of a plant is agreeable to truth may be inferred from consulting the best authors on Botany: thus the illustrious *Boerhaave* defines a plant to be a hydraulic body, containing vessels, replete with different juices, by means of which it derives the matter of its nutriment and growth; to which he might have added, possessing the power of producing its kind forever by *seed*.

Although agriculture and gardening are of prime importance to civilized man, they have continued to be only arts, consisting of detached facts, and vague opinions, without a true history to connect them. And the first step towards giving Botany the stability of a science is to submit a plant to anatomical investigation, as we do animals; that being, says Dr. A. Hunter, the only rational method of arriving at any certainty concerning the laws of the vegetable economy; and without it, agriculture, that useful, important, and honourable profession, must ever remain a vague and uncertain study.

In teaching Botany, different authors have adopted different plans. Some begin with a description of the leaf; then of the stem; next the flower; afterwards the fruit, strictly so called, and lastly the seed. Others commence with the flower, then they describe the fruit and seed conjunctly, and lastly the root. We shall pursue a different order. We shall begin with describing a seed; after demonstrating its structure, we shall show that *every* seed contains, under several membranes, the future plant in miniature. There we may see by the help of a microscope, that the embryo plant has, not only a little radicle, which is hereafter to become the root, but also two diminutive leaves, which hereafter become the herb. We shall then endeavor to show how the embryo plant, when placed in a due degree of moisture, and a just degree of heat, and at such a proper depth in the ground, as not to exclude it from the vivifying influence of the air, gradually unfolds itself; the radicle extending itself into a root, which attaches itself to the earth, and the little leaf aspiring into a stem. We shall show how

the fœtal plant is supported by that part of the seed, which answers to the *albumen*, or white of an egg, until it is able to appear above ground, when this temporary nutritive part drops off and decays, leaving the plant, in future, to grow, and to flourish, by imbibing solid nourishment from its mother earth; and by inspiring *vital air;* and by inhaling the celestial light.

Delightful as Natural History really is, the study of it is not here recommended to amuse the idle, or gratify the fanciful. We Americans dwell in an agricultural country; and agriculture is the sure and certain support of a nation. It gives to a country the only riches that it can call its own. *Tacitus* says, that the Romans were several times reduced nearly to famine, by dependig on Egypt and Africa for *grain;* instead of relying on the prolific vigor of their own Italian soil: and thus says this celebrated historian, were the lives of the Roman people committed to the caprice of the winds and waves. If commerce bind the world together in a golden chain, that chain is frequently broken by the wars of men, and by the wars of the elements; while agriculture gives us the staff of life, and the chief support of our independence.

Commerce is congenial to all of us who sojourn near the sea; and is indeed the grand source of wealth, comfort and power: but with riches, commerce too often imports effeminating luxuries; whereas agriculture is an athletic task, kindly imposed upon man by a beneficent Creator, as the best means of preserving his health and his innocence.

Now the ground-work of this salutiferous and honorable profession is the science of Botany, in the enlarged sense, which we have given to this branch of Natural History.

Some complain that the science of Botany is incumbered, and overloaded with technical terms. Our great master Linnæus wrote in Latin. Sometimes he gives generic names compounded of two entire Latin words; but he uses commonly, such compound words in the Greek language, as are more expressive as well as more beautiful. Beginners are sometimes daunted by this terrific style. They are apt to conclude that good sense has not fair play when thus oppressed by hard words. They do not perhaps know that Linnæus has simplified the botanical language of his predecessors. Before his day, we had *Hydrophyllocarpodendron*, and *Stachyarpogophora.* To convey botanical descriptions in a plain, simple, yet intelligible language to the merely English reader is a difficulty still to be encountered. There is another difficulty of a more delicate nature. The *sexual* system of Botany is founded on a discovery that there is in vegetables as in animals, a distinction of sexes. But there are those who think that Linnæus has drawn the analogy too close and continued it too long. The

analogy between the structure and functions of the higher class of animals and vegetables is remote; but the analogy between the higher order of vegetables and those outskirts of animated nature, the *Vermes*, and Insects, is closer than is commonly known.

SEED AND FOOD OF PLANTS.

In describing a Plant, we shall adopt a different order from that commonly pursued by botanists. We deem it more agreeable to the laws of botanical philosophy, to begin with the description of a *seed*; and to trace its gradual development into a perfect plant, producing seed again, then to reverse this procedure, as is commonly done, by treating of the seed last.

A seed of a plant and an egg of a bird are so analagous in their structure and economy, that we may, without impropriety, use the same term for either. By a seed then we mean an organized particle, produced by a plant, or animal, from which new plants, and new animals are generated. All seeds of plants and all eggs of animals have essentially the same structure, and the same mode of development.

A perfect, or fecundated hen's egg is an organized body, pervaded by vessels, and endowed with that humble portion of life, or capability of living, which, in the scale of vitality, we denote by the term excitability; and is replete with a moveable fluid, and inclosing, under divers membranes, the animal in miniature. The egg-shell is almost entirely filled with a glutinous substance, laid up for the nourishment of the fœtal animal: the one is called the *albumen*, or white; the other, *vitellus*, or yolk. In the latter is the *cicatricula*, or *punctum vitæ*, which is about the size of the seed of the vetch, or small pea, and has a considerable resemblance to the pupil of the eye. It is in this spot that the first palpitation, or signs of life appear, in consequence of the application of heat.

If the egg be kept in a certain degree of warmth, whether by the natural heat of the parent animal, or by art, as in stoves, it occasions an increased action of that *vis vitæ*, or living power, which every organized body, susceptible of stimulus, naturally possesses; and which, being a momentary distension of the smallest vessels, is similar to a blush, or rather that state of them, which immediately precedes the slightest inflammation. Motion thus begun, the vessels, surrounding and pervading the *punctum vitæ*, expand; and the embryo appears spontaneously to unfold itself, until by slow degrees it develops, like a flower, and becomes a perfect animal, capable of producing a similar egg.

Now every seed of a plant is, in like manner, an organized

body, endowed with vessels, and contains, under several membranes, the plant in miniature, which seed requires a due portion of moisture, and a just degree of heat for exciting the dormant *vegetative* life, which distending gradually the vessels, expands the several membranes, and develops the plant. The embryo plant lies in a sleeping state, though alive; but exerts not its life, until it is put in proper circumstances, which proper circumstances are *moisture*, *heat*, and some exposure to the influence of the *air*.

Every seed of a vegetable, and every egg of an animal hitherto examined, are in structure essentially the same. To grow, that is, to nourish itself, by changing a foreign matter into its own substance, and to continue its kind, is the end and aim of every living organized body. Let us examine the seed of a vegetable, that we may see how far such a body is adapted to effect these important purposes. The Windsor bean, or, as we call it in this country, the *English bean*, from its size and shape, affords us the fairest example. If, when such a bean is fully ripe, you cut through its membranes lengthwise, in the direction of the eye, *hilum*, or little scar, it will naturally separate into halves. Simple maceration will have the same effect without cutting. These smooth and equal parts of the bean are called *seedlobes* by gardeners, and *cotyledons* by botanists. Of those seeds, that we use for food, they form the more farinaceous or nutritive part: thus in wheat, rye, and Indian-corn, they form the meal, while the investing membranes form the bran.

The most important part of the seed is the embryo; and the most important part of the embryo is the *corculum*, or little heart, punctum vitæ, or speck of life; because at this point in the hen's egg the first pulsation of life is discovered; but in the seed of a plant there is no palpable motion. The whole *seminal apparatus* contained within the external membrane of the bean, and which corresponds with the *albumen*, and *vitellus*, in the bird's egg, conspires, when acted upon by heat, to elicit the latent spark of vegetative life; and to nourish afterwards the unborn plant.

When the miniature plant is separated from the seed lobes, we can easily discern the leaf which is called the *plumula*, or that part which is hereafter to become the herb of the bean; and likewise the *rostellum*, or *radicle*, which creeping downwards becomes the root. The *cotyledons*, or lobes of the bean taken collectively, without any discrimination of albumen, or vitellus, appear through a microscope, to be of a glandular structure; and to have a regular system of vessels, resembling the placental veins in quadrupeds; and to run together, like them, in a few trunks, precisely at that point of the lobe where the embryo grows to the cotyledons.

Botanists define *cotyledons* to be the lateral, *bibulous*, perishable lobes or placenta of the seed, destined to nourish the *corculum*, and then to fall off. Now, these lobes afford a nutritive juice, resembling milk, for the sustenance of the unborn plant: but when the tender vegetable is so far advanced as to merit the name of an infantile plant, these evanescent lobes are converted into a pair of thick *seed-leaves*, which compose a shield of defence, until the plant has fairly and firmly taken root in the earth; then these two protecting leaves drop off and decay. And now the little, erect plant, depends, like the just born infant, on a *new* principle for its future existence.

From what has been said, it is apparent, that when a hen's egg is alive, it is fit to be eaten; but if killed, whether by too much heat, or by too great cold, or by violent concussion, or by being sat upon by the bird, and then abandoned, it soon becomes rotten. So in like manner a seed, though kept several years, is not a dead substance, like a pebble or a pearl; but is a body regularly organized, and arranged harmoniously into a system of vessels, glands, and membranes, and it is moreover, like a prolific egg, alive, or at least in a state or fitness to be acted upon by certain external agents, which agents are FIRE, AIR and WATER.

Some seeds will retain the vegetative life a great number of years. Indian corn has vegetated after keeping it upwards of seventy years. We neglected to mention that there was a small quantity of vital air in a sack, bladder, or partition, at the big end of every bird's egg; and we presume that there is a portion of the same kind of fluid in every seed; or it may be oxygen in a concentrated state, which is afterwards combined with *caloric* in the process of incubation. It appears also, that the most important, nay the essential part of that organized body denominated a seed, is the embryo; for it is that part alone which grows into a new plant, beginning again a new progeny. It likewise appears, that all the other parts of the seed are subservient to this; and that they are employed chiefly in converting the farina, or mealy substance of the seed into a lactescent fluid, which is conveyed by the lactiferous vessels to the embryo for its nourishment, which, like the infantile animal, is supplied with milk, until it can stand alone in the ground.

Although nature has established a marked uniformity in the internal structure of seeds, she nevertheless displays an astonishing variety in their external appearance. Neither mathematician nor painter can ever convey adequate ideas of their different shapes and variegated colors. Some shine like silver, and some like gold; whilst others appear like little balls of fire. It is remarkable that seeds are seldom of the same color

with the flower, which produced them. Seeds of a deep green are rare; blue still more uncommon.

Beside the *essential* parts of a seed already described, there are certain *accessory* parts, which, whilst they add to the beauty of the seeds, serve important purposes in their migration: such, for example, are the feathery crowns, or *aigrettes*, which serve as wings to waft them to a distance, as we see in the *Dandelion*, *Lettuce*, and *Thistle*. Who, walking the fields, has not observed,

> Wide o'er the *thistly* lawn, as swells the breeze,
> A whit'ning shower of vegetable down
> Amusive float? *Thomson.*

If seeds are diversified in shape and color, they vary as remarkably in their size. *One thousand and twelve* seeds of the tobacco plant weigh but a single grain, while a single cocoa-nut weighs several pounds. The *Ferns* differ from other plants in having their seeds in the leaves. They are very small, and when inclosed in the seed vessel, they altogether form a round ball with a notched band or rim of a beautiful structure. They have some resemblance to the fingers shut up, or clenched so as to form the fist; and when the seeds are quite ripe and dry, they become very elastic; in which state the seed vessel bursts open, not unlike the suddenly throwing open of the fingers, in changing their position from the clenched fist to that of the open palm. This sudden action throws the seed to a considerable distance; and then we see the two hemispheres, which composed the ball, in the situation of two empty cups. This is well expressed by an engraving in *Swammerdam's book of Nature.*

PABULUM, OR NOURISHMENT OF PLANTS.

> "Hence when a MONARCH, or—a *Mushroom* dies,
> A while extinct th' organic matter lies;
> But—as a few short hours, or years revolve,
> Alchemic powers the changing mass dissolve;
> Born to new life unnumber'd insects pant—
> New buds surround the microscopic plant. *Temple of Nature.*

Natural things which are common, are disregarded because they are common: while rare and monstrous productions are gazed at with idle curiosity and stupid admiration. What is more common than a seed or grain? Yet how few give themselves the exertion of inquiring what a seed really is! If a seed or grain answer the whole purpose for which the farmer supposes it was created, that of fattening his cattle, and feeding his family, he neither searches into its curious structure, nor inquires into its physiology. Nor is this to be wondered at. But that the lawyer, the physician, and the minister of religion

should go on through life as most of them do, without once stopping to inquire into the laws by which the acorn becomes an oak, is to the botanist surprising! There are few little things in nature more worthy of attention than a seed. It is a *system*, or complete whole, wrought up into a narrow compass, retaining a living principle. By system we mean a combination of many things reduced to regular dependence and co-operation. If we contemplate closely the vegetative life and growth in a seed, our admiration will increase at every view, so that our baffled reason will be compelled to seek a solution of its difficulties in a Power anterior to *Water—Air—Fire*—or *Light*. Some of the wise ancients were so impressed with the philosophy of the egg, or seed, that they taught that the *mundane system* itself sprung from an egg, hatched by *Nox*.

It is only organized bodies that are capable of growth. Every *organized* body grows; and beside them none. There are accretions among minerals; and concretions and crystallizations without end; but these do not rise up to our idea of *growth*, which implies matter organized into vessels, containing a moveable succus, or juice, operated upon by a very gentle heat; whereas the changes wrought in the mineral kingdom, are commonly by a very violent one. If we knew how a single fibre grew, we could tell how the whole plant or animal grows; for the bodies of both of them are only assemblages of fibres differently formed and combined. Growth always operates by nutrition; and nutrition incorporates into the fibre, external matter, or matter taken in, *ab extra*, and this process always requires heat. Now all bodies in nature are imbued, surrounded, and penetrated in every way by fire, or rather *caloric*, which is a better and more expressive term for that all powerful agent which transforms solids into fluids, and fluids into vapor.

Although heat, or caloric, which is the fluid matter of heat, expands the egg and causes it to grow up into a living animal; and although it agitates and gently unfolds the plant, causing it to grow from an acorn up to the magnificent oak, yet this query arises naturally in the mind of the young student of nature, *what is the pabulum*, or *matter*, which adds to the bulk, and increases, to a certain size, the vegetable and the animal? For it is evident that heat only causes an absorption of a foreign matter. Nutrition, or growth, implies life; but in some vegetables, this life is so low in the scale of vitality as to be almost down to where Nature has marked her degree of o.

That an animal receives its pabulum or matter of nourishment and increase from without, is known to every one from the irresistible calls of hunger, and the destruction that follows famine. But that plants were nourished, and sustained by *food*, in nearly the same way, has not been so generally under-

stood. The animal has a warm receptacle, or stomach, of about 98 degrees of heat, with a due quantity of moisture, and peculiar compound motion; whereas the plant has no such receptacle, nor any other stomach than the cold earth, which is about 53 degrees of Fahrenheit. The possession of a *stomach* lays the discriminating line between the animal and vegetable kingdom. All other distinctions fail us.

Besides air and water, to which we may add fire, animals stand in need of aliment, or food taken by the mouth, digested by the stomach, forming there a milky liquor, called chyle. The constituent parts of the chyle of quadrupeds and birds, as well as most other animals, are, *water—sugar—mucilage—oil—carbon—phosphorus*, and *calcareous earth.* The constituent parts of the *sap-juice*, which is the chyle of vegetables, is, in like manner, water—sugar—mucilage—oil—carbon—phosphorus, and calcareous earth.* Now, sap-juice, or the chyle of vegetables, is absorbed from the earth, by the roots, which have a peculiar structure, adapting them to that operation; and from this juice, farther elaborated, refined and exalted, is formed the various fluids in the stem, leaf, flower, fruit and seed. Some plants can extract, or compose these nutritive substances from water, and apparently from the air alone. We however find by repeated experiments, that there are certain substances, which contribute more to the production of this vegetable chyle than others. Let us then inquire *what these materials are, that afford the* FOOD *of plants?* The subject is not merely curious, but of high importance to our country; for if we can ascertain the appropriate aliment or food of any particular family of our most useful vegetables, we shall be able to increase their size with as much certainty as a farmer fattens his cattle by giving them corn.

It is known from experiment that a plant will grow in *sand alone* moistened with water, purified by distillation from all earthy particles, and in the purest air.

But a plant will grow better in a mixture of *sand and clay*, in which the tenacity is adapted to the pushing power of its roots, than in sand alone; and it will grow better still, if a proper quantity of water be applied. But with both these advantages it will not flourish so well as in a *rich soil.*

If a plant be put in a proper mixture of sand and clay, and duly supplied with water, it will grow better than in the same mixture, exposed to the hazards of the weather, and the chances of being too moist or too dry; but it will grow still better in a rich soil. There is, therefore, in *a rich soil*, SOMETHING inde-

* *Calcareous earths* are marle of all sorts, limestone, chalk, plaster of Paris, and all earths, formed from the bodies of animals, especially the shells of fish.

pendent of texture, or the retention of water, which contributes to the flourishing of plants.

From observing the fertility after the ground was divided by the plough, some have imagined that the *earth* was the food of plants. To this opinion succeeded another equally erroneous, that *water* was their aliment, when in fact it is only the vehicle of their nourishment.

The upper stratum of earth, or garden mould, contains some articles that are soluble in water, and some that are not. Those which are insoluble in water are, according to FORDYCE, *sand*, *clay*, *calcareous earth*, *magnesia*, *oxydes of alum*, *earth of metals*, particularly of *iron*. These cannot enter the vessels of the roots of plants; but they may contribute to the production of substances which are soluble in water, and that may enter them.

Substances found in this black garden mould, that are soluble in water, are, says the same author, *mucilage*, *nitrous ammoniac*, *nitrous selenites*, *common ammoniac* and *fixed ammoniac*. We find all these salts in the juice of vegetables; a proof that they pass into the plant along with the water.

From numerous well conducted experiments, it appears that a MUCILAGE, produced by the decomposition of vegetable and animal recrements, constitutes the food, or aliment of plants. This mucilage is formed from stable manure; from rain water putrefied, from dew, as well as from dead animals, and vegetables. But mucilaginous juices are of two kinds: one, when dissolved in water, forms a sort of jelly, and is an *immediate* aliment: the other forms a gummy, or rather saccharine liquid, and must putrefy before it can become a proper food or manure.

To reconcile the doctrine taught by some, that *salt* is the active principle in manures, it should be remembered that putrefaction has *two* stages; that the first converts animal and vegetable substances into a mucilage; and the second converts that mucilage into one or more species of salt.

As mucilaginous substances were known to invigorate roots, by affording them good nourishment, it was natural for agriculturists not enlightened by chemistry, to infer that *steeping* seeds in mucilaginous, or oleaginous liquors would increase their powers of vegetation; especially if a portion of nitre, common salt, and lime were added. This opinion prevailed among the ancients, as we learn from Pliny, and is also recommended by Lord Bacon. A belief in the efficacy of the fructifying liquors still prevails in many parts of Europe, notwithstanding Duhamel in France, and Dr. A. Hunter in England, have exposed their futility.

Dr. Hunter assures us, that he sprouted all kinds of grain in

a variety of "*steeps*," so called in England; and always found that the radicle and germ of the embryo plant never appeared so healthy, as when sprouted by pure water. He tells us that he constantly observed that steeps containing nitre, sea-salt, and lime, rendered the radicle and germ yellow and sickly. He then steeped a variety of seed in broth, as coming nearer to the nature of the mucilage beforementioned, and, at the same time, put an equal number of the seeds in pure water. The result was, that the radicle and germ, produced by the broth, were weaker, and less healthy than those sprouted by simple water. Here the scientific agriculturists have been led from the path of truth and nature, by following some erroneous notions of the physicians, who conceive, that if they give their weak, emaciated, hectic patients milk, broth, or jellies, they will pass as such into the blood vessels, without giving any labor or trouble to the debilitated organs of digestion; not considering that milk, for example, is first hardened in the stomach, by the coagulating property of its internal coat, into a curd, and then gradually digested, and, in a degree animalized, before it enters the blood vessels; and these messes occasion more trouble to the stomach than a piece of beef. The milk which nourishes the embryo plant, is as far distant from the steeps used by Dr. Hunter, as eggs and milk are from the *animalized* lymph in the blood vessels. The same philosophical physician proves that the opinion is erroneous which is entertained by some gardeners and farmers, that small thin grain may be so impregnated by steeps, as to make them equal, in vegetative force, to the largest. He found, by repeated experiments, that the largest and plumpest seeds, from the same heap, were superior in goodness to the small, thin ones, though steeped ever so carefully.

If what we have said of the office of the *seed lobes*, be just, that the farina, or meal of which they are composed, is converted into milk; that it serves to nourish the infantile plant until its roots are large enough to imbibe mucilaginous food from the earth, it follows, that the vegetative powers of seed will be in proportion to the *quantity* of their mealy substance. If so, then it will remain an established truth, that PLUMP *seeds, placed at a just depth, in a good soil, and at a proper season, will never disappoint the gardener.*

From the preceding doctrine it also follows, that the *food of plants*, or *manures*, are of *two kinds;* the one adds nourishment to the soil; such as all animal, and other putrescible substances, from which a *mucilage* is formed: the other gives no nourishment to the soil; but *forces* it, by agitating and preparing the nourishment already there. Hence we see how substances, of opposite natures, contribute to the growth of vegetables—putrescent animal substances on one hand; and lime, marle, and plaster of Paris on the other.

PLANTS PASS INTO EACH OTHER BY DECOMPOSITION.

" And so each part *returns* when bodies die,
What came from earth to *earth*, what from the sky
Dropt down, ascends again, and mounts on high.
For DEATH doth not destroy but disunite
The seeds, and change their order, and their site:
Then makes *new combinations*, whence arise
In bodies all those great varieties
Of shape and color." *Creech's Translation.*

Every thing generated by nature, or made by art, is generated or made out of something else ; and this something else is called its substance, or *matter*. But there can be no change of one thing into another, where the two changing beings do not participate the same matter. Hence were there not a congeniality between the food and the plant, and the food and the animal, these two organized bodies could not be nourished; but the material imbibed, would operate as a medicine, instead of being assimilated as an aliment.

Whoever attends closely to the operations of nature will be convinced, that every recent production, whether vegetable or animal, that daily occurs, is not absolutely a fresh creation, an evocation, or calling of something out of *nothing ;* for that is impossible. "*Ex nihilo nihil fit.*" What then is it. 'Tis a change, or a mutation of something which *before existed.* Every thing around us is in motion. No terrestrial thing is stationary. On every earthly thing mutability is written ; and substances of every kind, either *immediately*, or *intermediately* pass into one another ; and reciprocal deaths, dissolutions and digestions support, by turns, all substances out of each other.

We have said that every living thing, or organized being, derives its origin from an egg, or seed ; and this doctrine may be extended beyond the objects of sight. When the SUPREME CREATOR, says the eloquent *Count Buffon*, formed the *first* individuals of each species of vegetables and animals, he gave a certain degree of animation to what has been called "*the dust of the earth ;*" by infusing into it a greater, or smaller quantity of *living organic particles*, or *seeds*, which infinitessimally small seeds, or particles are indestructible, and common to every organized being. These particles, or *original* seeds, pass from body to body, and are equally the cause of life, nutrition and growth. When an organized body dies, the organic particles survive, for death has no power over them, but they circulate through the universe, pass into other beings, producing life and nourishment. A growing vegetable receives these invisible seeds, or organic particles from the earth, from water, and from

the air; and their reception perfects the plant. A quadruped receives the plant into its stomach for food; when its digestive powers destroy its vegetative life, should any be remaining, and then the digesting apparatus animalizes the vegetable, and gradually converts it into the nature, and substance of the creature. And when this animal dies, his constituent particles fly off in vapour: these are absorbed by the growing plant with avidity, they being its appropriate food; and this absorption of putrid vapour causes them to grow, and to flourish; and thus do animals and vegetables mutually nourish and support each other; so that what was yesterday grass, is to day part of a sheep, and tomorrow becomes part of a man.

From the foregoing doctrine may be deduced the true theory of the action of *manures;* or the sustentation of a plant by its appropriate food. This is the corner stone in the foundation of that Temple of *Ceres*, which we hope to see reared in AMERICA. It will moreover illustrate that doctrine which teaches, that in this world which we inhabit, there is an universal change, or mutation of all things into all; that nothing is lost, but the sum total of matter in the universe remains perfectly the same; and that what some consider as fresh creations, or calling of something out of nothing, is only a change or mutation of something which before existed.

From the experiments previously recorded, we learn, that there is *something* in a rich soil beside water, which contributes to the growth of a plant; and it appears that there is a mucilage produced by the decomposition of vegetable and animal recrements which affords the matter, *pabulum*, or provender for the support of plants. If it be inquired farther—of what is this mucilage composed? We answer, that its base is a gluten resembling the *coagulable lymph* in our own blood vessels. The oxygenous principle concerned in germination will be spoken of hereafter.

The growth of organized bodies is a mysterious process. Philosophers who believe with *Lucretius* and *Buffon*, in the pre-existence of germs, or seeds, organic particles, or *moleculæ*, denominate them which you will, have endeavored to sooth the imagination by an hypothesis. They have supposed that these very subtle germs, or seeds of things, were merely susceptible of life by the application of a due degree of heat; and that they were, at the creation of the world, dispersed universally into all parts of this terraqueous globe, that are accessible to air, and to light; so that they are in the waters, as well as in the earth.

So that the production of vegetables, or any other organized body is only a *dissemination* of what before existed. They grew or unfolded themselves only when they fell into a proper matrix, or nidus, adapted by nature to their support and growth.

Thus for example, if the eggs of certain insects fall on my writing desk, they perish; because the cloth which covers it, is not the proper nidus, or matrix for them; but if they are deposited on a piece of cheese, that being their proper matrix, they soon become animated. This doctrine opens to our view an host of comforting facts, that banish entirely the dismal one of equivocal generation. Now we presume that while a vegetable is growing and flourishing, it attracts and absorbs these original seeds, or moleculæ, from the *earth*, and from the *water*, and from the *air*, and that this imbibition is continued until the plant attains its full perfection; and when it has risen to its acme, it rejects their further admission into all its parts; and therefore instead of being distributed as heretofore all over the plant, they now tend to the seed vessels only, and there form and perfect the seed, which increase very rapidly; and become *an organic particle of a larger size.* Nearly the same process takes place in animals.

To scrutinize how an organized body *first* began, is, perhaps, a presumptuous attempt, but to inquire after what manner, when once begun, they have been continued, is a work more suited to human abilities, and is gratifying to the towering faculties of reason, and honorable to religion; provided we substitute for the disconsolate doctrine of blind and vague chance, conspicuous in *Lucretius*, that of an intelligent, and sovereign *Creator* and *Legislator* of the universe, the Almighty Director, and merciful Controller of that never ceasing change, or circulation, through which *every thing* on this evanescent globe is doomed to pass.

From what has been said, it appears that a seed, the garden bean, for example, is a body regularly organized, and arranged into a *system* of vessels, glands and membranes; and that it is in a degree, alive; so far at least, as to be in a state, or fitness to be acted upon by certain external agents, which agents are, *fire*, *air*, and *water*, or to speak more correctly, a certain vivifying principle, in the air, and in the water, called *oxygen*, which is the very spirit of fire and flame. This oxygenous principle lies in a dormant state in the hen's egg, until it is awakened by fire, or caloric, which combining with it, expands, and agitates the subtle fluids, and the very minute vessels of the egg, so that the wheel of life begins to oscillate; and then slowly to rotate; and at length, the membranes thicken and all the parts gradually unfold themselves: the same thing takes place in the seed, or bean, when placed in the earth.

But we cannot advance with confidence a step farther without some knowledge of the properties of the wonderful agent *fire;* which alike animates and sustains the great system of the world, and the diminutive system in a seed. What shall we say on this

subtile subject? Fire or caloric by a gentle agitation enlivens all entire organized bodies, and conducts them by slow degrees to their destined perfection. It foments the embryo plant in the seed, and the miniature branch in the bud. But fire illudes inquiry by its being totally invisible; for it becomes visible only when it borrows a body to appear in. It seems secretly to unite itself to an inflammable something, and when united with this inexplicable principle, it enters into the composition of other bodies. But a mind that has scarcely ceased vibrating between the Priestlian doctrine of *phlogiston*, and the Lavoisierian doctrine of *oxygen*, feels the utmost diffidence in speaking of a subject in which a BACON,* a NEWTON, and a BOERHAAVE, a PRIESTLY, and a LAVOISIER, have all guessed differently. The *Botanist* ceases to wonder that sensible nations, not blessed with a revelation from heaven, have worshipped the *sun*, or a *flame of fire*, as the Deity. He believes that this vivifying something called *fire*, or *caloric*,† fills the immense space of the whole universe, pervades all bodies, and actuates every particle of matter; and that by it the phenomena of magnetism, fire and light are produced; and that on it the various and astonishing phenomena of *vegetation* and *animation*, depend. He moreover believes that the SUN is the efficient cause of the motions of this fluid; and that the various phenomena of our system, are the effects of these motions; but the modus operandi of this *anima mundi* is, like its great Author, past finding out!

Let us turn from this difficult subject to one that is more within the management of human abilities. It appears from experiments that *oxygen* gives seeds their first determination to germinate; just as the same vivifying principle first excites the movements of life in a bird's egg. Old seeds, that would not germinate, even in the most favorable soil and situation, have been made to vegetate, by sprinkling the earth, in which they were planted, with water, to which was added some *oxygenated muriatic acid.* Garden cresses, thus treated, germinated in *six hours;* while those, treated with common water, required *thirty-six* to produce the same effect. Metalic oxydes, or calces of ores, and burnt clay, are good manures, because they abound with oxygen.

Whoever takes an extensive view of those slow operations that are going forward on the globe which we inhabit, will per-

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* *Lord Bacon* pronounced *heat* to be the effect of an intestine motion, or mutual collision of the particles of the body heated; an expansive undulatory motion in the minute particles of the body, by which they tend with some rapidity towards the circumference, and, at the same time, inclined a little upwards.

† The chemists of the present day use the word *heat* to express the *sensation*, and have adopted the word *caloric* to express the *cause* of the *sensation of heat.*

ceive that the decay of animals increases the quantity of such matter as is fitted to become the food of vegetables, and vice versa. Calcareous earth is produced by the exuviæ, recrements or remains of animals, especially their *shells*, which shells, left at the bottom of the ocean, until they have become wonderfully accumulated, and since elevated by submarine fires, constitute, at this day, those immeasurable strata of chalk, marble, and lime-stone, which are found here and there, throughout the earth. The strata incumbent on these, consisting of coal, iron, clay, and marle, are principally products of the vegetable kingdom. Thus are all these strata of materials fabricated, *circulated*, and, in the course of countless ages, refabricated, and *recirculated* by the procedure of vegetable and animal life, and decay. Hence may we not conclude with the modern *Lucretius*, that vegetables and animals, during their growth, increase the quantity of matter which is fit, or capable of being fitted for the food of each other; while they elaborate a part of the materials of which they consist, from the simple elements of hydrogen, nitrogen, carbon, phosphorus, and oxygen, into which modern chemistry has resolved them by analysis?

This transmutation of animal to vegetative nature; and of the vegetable again to animal, may be rendered perhaps more intelligible by the following example from Darwin. In *animal* nutrition, the organic matter of dead animals and vegetables, taken into the stomach is there decomposed; and the most nutritive parts are absorbed by the lacteals, and so become part of the creature. In *vegetable* nutrition, the organic matter of dead animals and vegetables suffers likewise decomposition, and undergoes new combinations, on, or beneath the surface of the earth, while the more nutritious parts are absorbed by the roots of the plant in contact with it.

THE SEED OF PLANTS.

We have said that there are few little things in nature more truly surprising than a seed; that each seed was a system, or complete whole, wrought up into a narrow compass, and retaining a living principle.

The ancients, from the scarcity of books, and some other causes, had their attention less divided than the moderns. They therefore viewed Nature with keener eyes, and more concentrated attention, than those who have lived since the multiplication of books by the discovery of the art of printing. They were of opinion that every thing, even the great globe itself, sprang from an Egg; which egg, their poets say, was hatched by Nox, *night*, or *obscurity;* or something behind a dark veil, which they could not see through.

Some, less diffident than the sagacious ancients, imagine that they have penetrated this veil, and illumined the obscurity by saying that *fire* is the primary cause of the development of a seed. Be it so. But what do we mean by *fire*, or *caloric?* Is it here any thing more than a mere word denoting the last term of our analytical results? We moderns have decomposed substances, which under the ancient doctrines of philosophy, had passed for elements, not susceptible of decomposition. We have been able to dissect LIGHT, analyze AIR, and decompose WATER, and have discovered substances which all previous investigation had found too subtle for the detection of the senses; but we have not yet detected the *essence* of fire. When therefore, we attempt to investigate the primary motion in seeds, we should not stop at the visible effects, but push forward to the invisible cause. Thus when we speak of the motive powers of magnetism, or electricity, we should strive to raise our minds beyond these visible effects to the cause of them. In such an intense view of things, we must exclude the word *spontaneity* from the book of Nature. We must not grant it even to fire, which constitutes fluidity.

If proud science be humbled by speculations of this sort, the agriculturist may indulge his pride by considerations of another kind; by reflecting that he is, in some degree, a partaker in the power and privilege of the CREATOR; who has enabled him to rear from a few organized particles, a field of vegetables, a variegated garden, or a forest of trees. Man alone, says the chemist *Chaptal*, possesses the rare advantage of knowing a part of the laws of nature; of preparing events; of predicting results; of producing effects at pleasure; of removing whatever is noxious; of appropriating whatever is beneficial; and of composing substances, which nature herself never forms: in this point of view, himself a creator, he appears to partake with the SUPREME in the most eminent of his prerogatives!

From this digression we turn again into the path, whence we musingly wandered; which path is to lead us to a full view of that *Nemorale Templum*, which christian philosophy consecrates to the honor of the PARENT OF UNIVERSAL NATURE!

Of the Anatomy of a Vegetable.

The principal vessels of plants are of two kinds, *tubes* and *cells*. The tubes run from the roots to the different parts of the plant in separate bundles, communicating with each other, but not branching and joining, or anastomosing, as in animals. These tubes contain the sap-juice, or chyle of the plant. When immersed in a watery fluid, they fill themselves on the principle, some suppose, of capillary attraction; but as this principle is not yet clearly settled among philosophers, we are inclined to

believe with *Fordyce*, that it is from a power similar to the muscular power in animals, by which this absorption, and all other motions of vegetables are performed. These tubes terminate in *cells*, which cells contain the peculiar juices of the plant.

In the root of a plant certain cells surround the tubes; which are opened only at the extreme point of them; and fluids cannot be absolved any where else. The tubes are not simply open at the end of these radicle fibres; but there is a *particular structure*, or *configuration*, which adapts them to the imbibition of fluids; so that if the ends of all the fibres of the roots of any vegetable be cut off, the growth of that vegetable is stopped until a fresh configuration is formed. As roots can only absorb nutriment from the very points of their fibres, the configuration, just mentioned, defends the absorbing tubes from a superabundance of water. The roots of some plants will bear without injury a greater quantity of moisture than others. Those of aquatic plants have a peculiarly firm structure, for defending them from the effects of long maceration.

Linnæus has not rejected the idea of certain philosophers, who defined a plant to be an *inverted animal*. He considers its roots as its lacteals; the earth as its stomach; the trunk and branches the bones, and the leaves its lungs. There is, however, this difference between them; an animal is an organized body, or a kind of hydraulic machine, nourished by roots, or syphons, or in other words the lacteals placed *within* him. A plant is in like manner an organized body, or kind of hydraulic machine, nourished by means of roots, made up of lacteal vessels, or syphons, placed on the *outside* of it. Moreover, is not the long cylindrical absorbent vessel, which runs from the roots of trees up to the caudex of each bud, and which enters at the foot stalk of each leaf analogous to the *thoracic duct* in animals.

Every part of a plant that is under ground is not its root. Some vegetables, as the onion, the tulip, and all the tribe of lilies, terminate in a large bulb. But this bulb is not the root; but the *hybernacula*, or winter quarters of the vegetable *ens*. It is a subterraneous bud, inclosing the embryo plant, and protecting it from the destructive effects of frost. The radicles, or stringy appendages, proceeding from the bulb, as in the onion and tulip, are in fact the roots; because they alone contain those absorbing tubes, through which nutriment is imbibed from the earth. The Marquis de St. Simon, however, controverts this doctrine; and imputes the absorbing power to the middle part of the bulb. The absorbents in a plant differ from those in animals in the facility with which they carry fluids *either* way. Invert a plant, and its roots, now in the air, will produce leaves; and its branches, now in the ground, will shoot forth into roots; or rather radicles, or ligneous absorbents.

The roots of plants show a remarkable instinct in searching for food, by creeping towards collections of water, and into a rich soil. The roots of plants, says *Bishop Watson*, seem to turn away with a kind of abhorrence, from whatever they meet with, which is hurtful to them; and to desert their ordinary direction and to tend with a kind of irresistible impulse towards collections of water, placed within their reach. Thus the *willow* creeps into our wells, after water; and has been known to form a mat, or netting across them. The *Lombardy poplars*, which now ornament most of the cities, and many of the villages in America, have very extensive roots, running horizontally at a small distance from the surface of the ground. They injure our gardens, and damage our pavements in the streets, in search of water, or of air. This growing evil, will perhaps compel us to eradicate these handsome trees from the streets, which they at present adorn.

In summing up all that has been said, it appears that a seed is the sexual offspring of a plant, containing not only the rudiments of the future vegetable, but also a quantity of aliment laid up within its membranes for its early nourishment. A whitish substance of a delicate nature forms the substance of the seed. Small vessels, which proceed from the germ are in every part of this substance, dividing, and subdividing it every where. After the seed has laid in the ground, moistened and warmed to a certain degree, it gently expands, and then begins to shoot forth; the radicle downwards, and the plumula upwards. The warmth, which had penetrated its outward folds, operates on their moisture, and dissolves the mealy substance of the seed lobe, and mixes with it. Of this mixture is formed a kind of milk, which being conveyed to the infantile plant by a concourse of vessels, terminating in a little protuberance or papilla furnishes it with nourishment, adapted to its tender age, and extreme delicacy.

By these means the radicle, or incipient root unfolds itself, and increases in bulk and extent every day. In a short time, it seems to become, like the chicken in the egg, sensible of too close confinement, and it makes an effort to come forth. The small orifice, which may be observed on the outside of the bean, and every other seed, facilitates its egress. Then the radicle creeps downwards into the earth, and soon after the plumula stretches upwards to taste the air, while the seed lobes, emulating leaves, serve as shields to defend the infant plant from harm. As the plant acquires size and strength, these are no longer useful, but dropping off, perish; and from this time forward the plant depends for its coarser nourishment on certain fluids in the earth; and on more subtle and refined ones from the atmosphere. For it is with plants as with ourselves, while our sto-

machs are digesting coarser food, our lungs are digesting air; so that while plants are receiving mucilage from the earth, their leaves, or lungs, inspire the oxygenous, or vital principle from the atmosphere.

From this view given of the seed, and its economy, the assertion will no longer appear strange, that the spacious oak once existed in an acorn.

THE ANATOMY OF A VEGETABLE; BEING THE EXAMINATION OF A TRUNK OF A TREE FROM WITHOUT INWARDS.

The pulpy acorn, e'er it swells, contains
Ths oak's vast branches in its milky veins.

Grain within grain, successive harvests dwell,
And boundless forests slumber in a shell.

We left the infantile plant struggling for life, and extending its roots, which contain those vessels that answer to the lacteals in animals, in order to imbibe nutriment from its mother earth; while the *plumula*, or little stem and leaf were aspiring to drink the vital air, which soon changes it from a yellowish white to a beautiful green color. That leaves do not acquire this splendid green before they enjoy the light of heaven, is known to every one who has noticed plants growing in dark cellars, or covered over with boards, or otherwise secluded from the sun's rays.* We shall resume this subject when we speak of the office of the leaves in cleansing a foul atmosphere from putrid exhalations.

In cutting the trunk of a tree from the circumference to the centre, the instrument passes through seven distinct parts, in the following order:

I. The Epidermis.
II. The Cortex.
III. The Liber.
IV. The Alburnum.
V. The Vascular Series.
VI. The Lignum.
VII. The Medulla, or *Pith*.

Under which of these heads must we place the silver grain, or those bright radii which pass from the centre to the circumference? Are these anything more than mechanical braces of the ligneous part of the tree, a sort of dovetailing to preserve the limb from breaking into concentric circles, on suffering vio-

* The operation called *bleaching*, or *etiolation*, renders plants less acrid, and is usually performed on endive and celery.

lent flexures in high winds and storms? Or do they contain the air vessels, passing from the epidermis to the centre?

The *Epidermis* is a delicate, but firm, transparent membrane, covering the plant every where. It is impenetrable to water, and, like the cuticle of the human body, is sooner elevated in the form of a blister, than destroyed by any corrosive fluid. The epidermis of vegetables is, as in the human scarf-skin, a single membrane, although Duhamel says that he counted six in the birch tree, and our countryman, Dr. Barton, distinguished twice that number. Notwithstanding this respectable authority, we apprehend, that both these naturalists were deceived. We admit, as a well established opinion, that the epidermis, or cuticle of a tree, is renewed every year; and that where we discover several layers, they are only the old ones, beneath the recent one. Some trees, says Darwin, have as many cuticles, as they are years old; others cast them more easily, as a snake casts its skin. Hence the service of currying or scratching trees.*

The use of the epidermis is to protect the ultimate ramifications of the aerial and aqueous vessels; those minute vessels by which they are enabled to absorb aeriform fluidities, which are needful to the life, health, and beauty of the plant.

On removing the epidermis,

The *Cortex*, or *hide* of the plant, as the word imports, appears. This is the part known to every one by the name of *bark*. It consists of vessels, glands, and *Utricles*, which are little bags or cells, inosculated, contorted, interwoven and compacted, in such a manner as to render it very difficult of demonstration. It is among this compounded structure of the cortex, or bark, that the work of digestion is performed; and the product of this digestion is conveyed through the whole vegetable, till at length the leaf and the flower, the first the lungs, the last the face, mouth and entrails, perfect the plant. It is in the bark of the plant that the medicinal virtues principally reside. In this reticular substance are found the oils, resins, gums, balsams, and more occult virtues, so precious to the healing art. The Peruvian bark and the cinnamon have stamped celebrity on this part of vegetable.

After the bark is stripped off, we discover the third integument, namely the *liber;* which consists of laminæ, or plates, bound together by a cellular matter, which, when dissolved by

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* It is said, if you continue to scratch the curvature of a crooked tree, it will in time become straight. It resembles in this respect a contracted leg or arm, which is sometimes restored by friction. We should be careful not to scratch trees that exude a gum, such as peach trees. An insect will sometimes injure the bark of the peach tree near the surface of the ground, which occasions an exudation of gum, and soon after the tree becomes sickly and at length dies.

maceration in water, detaches these plates or coatings from each other; when they resemble the leaves of the *books* of the ancients; whence arose the name of *liber*. The liber is softer and more juicy than the cortex. It grows, however, harder and harder, until it assumes the quality and name of *lignum*, or wood.

Between the liber and lignum is interposed a peculiar substance called *alburnum* by *Linnæus*, *blea* by the British, *arebier* by the French, and *sap-wood* by the American yeomanry. It is whiter and softer than either the cortex or liber. It is not at all times easy to distinguish between the alburnum and the wood, the structure being similar. Indeed, the alburnum appears to be but the infantile stage of the wood, progressing from a mucilagenous to the adult state.

We have said that the liber grows harder and harder till it assumes the quality and name of lignum; but Du Hamel says that in certain circumstances the wood is capable of producing new bark. A cherry tree stripped of its bark exuded from the whole surface of its wood, in little points, a gelatinous matter, which gradually extended over the whole, and became a new bark; under which a layer of new wood was speedily formed. This gelatinous substance, or matter of organization is called *Cambium*, (from, I presume, the Italian word *cambio*, or *cambiere*, to *exchange*, or *commutate*,) which Mirbel supposes to produce the liber, or young bark; and at the same time, by a peculiar arrangement of the vascular parts, the alburnum, or new wood. Is this a process similar to the exudation of that part of our blood called coagulable lymph in consequence of inflammation in the human body? When, by inflammation, a vascular part of the body is roused to an extraordinary action, then millions of vessels are called into existence, and glands also, which secrete the coagulable lymph, or matter of organization, which is one link in the chain of renovation. Or is it like the exudation that repairs the broken shell of the snail? Or the exudation which forms the callus that reunites a fractured bone.

Between the alburnum and the wood lies a fifth ring, or circle of vessels, called the *vascular series*. Its structure is simple, being a single course of greenish vessels, lodged between two cellular membranes. It terminates, says Dr. Hunter, in the *nectaria* of the flower. Some botanists consider the vascular series as part of the alburnum.

The sixth part in order is the *lignum*, or wood, which is the most solid part of the trunk, and is defined by our great master to be the alburnum and liber of the preceding year, deprived of their juice, hardened and firmly agglutinated. The wood is composed of concentric rings. The centre of these circles is

generally observed to be nearer the north than the south side of the tree.

On examining a transverse section of a trunk, or large limb of a tree, an oak for example, we can generally observe, that the interior rings are harder than the exterior. It is a prevalent opinion, that one of these rings is added every year, and that, regarding the number of circles, we can ascertain the age of the tree. Some have ventured to deny this criterion, although they knew that Linnæus himself examined very aged oaks in some of the islands of the Baltic, with that principle for his guide. This illustrious secretary of nature was persuaded, that he could point out by the ligneous circle the severe winters of 1587, 1687, and 1709, as they were thinner than the rest. This circumstance merits the attention of our rural philosophers. Who knows, but we may hence form a probable conjecture of the age of those surprising antiquities discovered in this new world, on the banks of the Ohio and Muskingum?

Substantial as is the wood, or ligneous part of the tree, it is nevertheless so far from being an essential part, that many plants are without it. The arundacious plants, as the reeds and the grasses, and indeed all the gramina, are naturally hollow. How often do we see trees so internally decayed as to be kept alive merely by a vigorous state of the bark?

The seventh and last part is the *medulla*, or *pith*. This is a spongy or vesicular substance, placed in the centre of the wood, and is, according to Linnæus, essential to the life of the vegetable. In the new production of trees it consists of a number of oval, greenish, moist bladders, which at length become empty, dry, and spherical, and by degrees assume a whitish color. We know but little of the minute structure of the pith. It resists the tincture of the most subtle coloring fluids, and is as impenetrable to water as the pith of a goose quill. Ought we to infer, that the pith is destitute of vessels? May it not be like the most subtle parts of the brain of animals, the vessels of which elude the sharpest sight, by reason of their exility? In plants which have hollow stems, the tube is lined with pith.

Linnæus attributes great importance to the pith, and asserts, after Bradley, that it gives birth to the buds. Some botanists of the first rank believe, that the pith is, in a plant, what the brain and spinal marrow are in the inferior order of animals. The pith, says Darwin, appears to be the first or most essential rudiments of the new plant, like the brain, spinal marrow, and medulla oblongata, which is the first visible part of the figure of every animal fœtus, from the tadpole to mankind. It seems, however, that the pith is not essential or absolutely necessary to vegetation, as we often observe trees to live and thrive without it. The guaicum, or lignum vitæ, it is said, has no pith.

If the pith be the brain of a tree, may it not be with some trees as in some animals, in which the brain is not confined to the head, but spread all over them, as in the earth worm and polypus, the parts of which, though cut in pieces, live and become entire animals? Some animals, like some vegetables, are more vivacious than others. A tortoise will live and crawl several days after decapitation; because his body is replete with *ganglions*, which are subordinate brains, having an innate energy independent in some measure of the capital portion in the skull. After all, the office of the medulla or pith in vegetables is among the desiderata in the science of botany.*

There is no part of the anatomy of a vegetable involved in more intricacy and uncertainty than the *Vascular System.* Linnæus speaks of three kinds of vessels,

I. The *Sap vessels.*

II. The *Vasa propria*, or *proper vessels*, and

III. The *Air vessels ;*

but later botanists have increased their number to seven.

The *sap vessels* convey the sap juice or chyle of the vegetable. They rise perpendicularly, and pass principally through and between the wood and the bark; and though imperceptible, they must pervade the other parts of the plant.

The *vasa propria*, proper, or peculiar vessels, are so called because they contain the peculiar or specific secreted fluids, as the gum in the peach tree, and the resin in the fir. In these vessels are found the medicinal qualities peculiar to a plant. The utricles are small repositories, which contain the coloring matter of the plant. In them the nutritive juice of the plant is lodged, just as the marrow is preserved in bones, whence it is taken both in animals and vegetables, when they are not sufficiently supplied with chyliferous nutriment.

The *air vessels* are called *tracheæ*, from their resemblance to the respiratory organs of insects. They are found in the wood and in the alburnum, but not in the bark. In order to detect them, you must take a young branch of a vine and clear away the bark, and then break it by drawing the two extremities in opposite directions, when the air vessels may be seen in the form of small cork screws. See engraved representations of them in *Grew's Anatomy of Plants*, and *Darwin's Phytologia.*

These tracheæ, or air vessels, carry other fluids beside air. Darwin says they are absorbent vessels of the adult vegetable, and the umbilical ones of the embryon bud.

* Some have conjectured that the pith was a reservoir of moisture, against a dry season, like the deposites of marrow in the bones, or rather the fat in our bodies, and on which it is supposed we subsist during the emaciating state of fevers.

As to the *absorbent*, the *excretory*, and the *secretory* vessels, we shall speak of them when we describe the leaves.

To the foregoing description of the parts of a plant, should be added that which contemplates it as a whole. Linnæus in some measure helps us to that view of it, when he says, that the *cortex* of the flower terminates in the CALYX; the *liber* in the PETALS, or painted leaves: the *lignum* in the STAMINA: the *vascular series* in the NECTARIA; and the *pith* in the SEEDS.

It is very difficult to convey a clear idea of these different parts of a plant; we would therefore refer the reader to Grew's admirable engravings, copied after magnified specimens of various parts of a vegetable, which, though executed more than a century ago, have not been surpassed.

Dr. *Grew* and *Malpighi* began their anatomy of plants about the same time, unknown to each other—one in England, the other in Italy. Much praise is due to the Italian, but more to the Englishman. So finished are his descriptions, that he has left but little to his successors but admiration.

The best solar and lucernal microscopes of the present day serve to increase our admiration of the accuracy and industry of Dr. Nehemiah Grew in the anatomy of plants. His excellencies are numerous, and his mistakes few. Darwin contends, that what Grew and Malpighi called *bronchia*, or air vessels, are really absorbents; that they have been erroneously thought air vessels, in the same manner as the arteries of the human body were supposed by the ancients to convey air, till the great Harvey, by more exact experiments and juster reasoning, evinced that they were blood vessels.

We are not entirely satisfied with the account here given of the anatomy of a vegetable, from the epidermis to the centre. Grew, Hales, Du Hamel, Linnæus, and Darwin, with many living naturalists, have examined the minute structure of a plant, but every one of them has left a wide field for discoveries to his successor. We in America have not all the means for examining these things, as have our elder brethren in Europe. It is but lately that we have begun to construct microscopes; by whose magical powers men have called things that are not into existence, as well as established the existence of others that were doubtful.

FORM AND STRUCTURE OF PLANTS.

When cruder juices swell the leafy vein,
Stint the young germ, the tender blossom stain;
On each lopp'd shoot a foster scion bind,
Pith press'd to pith, and rind applied to rind.
So shall the trunk with loftier crest ascend,
And wide in air robuster arms extend,
Nurse the new buds, admire the leaves unknown,
And blushing bend with fruitage not its own.

Several philosophers distinguished for sagacity and industry have devoted a considerable portion of their lives to the examination of the structure of plants, and to the study of the process of vegetation; yet the subtile organization of vegetables has baffled their sight, though armed with the microscope; and the laws of vegetation have been but imperfectly explored. Who has been able to discriminate that peculiar organization in each kind of plant which gives the specific medicinal quality to each? If matter, considered as mere matter, give not the peculiar qualities to bodies, they must result from the different arrangement of the same matter in different vegetables. It is from the different modification of vegetable matter, which produces those various and opposite qualities, observable in two plants growing in the same bed of a garden, and breathing the same air, and which produces both bread and poison out of the same soil. It is, says Dr. Hunter, from the different elaboration of a mass of innocent earth, that gives life and vigor to the bitter aloes and to the sugar cane, to the cool house-leek and to the fiery mustard, to the nourishing grain of wheat and corn, to the deadly night-shade and the still more deadly *upas*.

It is imcompatible with our plan to exercise much attention in describing the different forms and structure of the trunks or stems of plants. Seven are enumerated by Linnæus.

1. The *caulis*, or stem properly so called, bearing the leaves and the flower.

2. The *culmus*, or straw, which species of stem is generally hollow, as in grasses.

3. The *scapus*, or stalk, which bears the fructification only, the leaves not being raised above the ground, as in the dandelion.

4. The *pedunculus*, or flower stalk, which bears the flower or fructification from the caulis. It is the stalk or immediate support of a single flower or fruit.

5. The *petiolus*, or stalk of a leaf. It fastens the leaves, but not the fructification.

6. The *frons*, a vague term, generally used to signify that the root, stem, leaf and fructification are all in one, as in ferns.

7. The *stipes*, which is the stalk or trunk of a frons, and is applied only to *palms*, *filices*, and *fungi*.

Turning from these things, let us examine some other objects, of more importance, viz.

THE BUDS.

A bud is a protuberance, hard body, or pointed button, being a compendium or epitome of its parent plant, jutting out from its stem or branches. A bud is composed externally of scales, which are elongations of the inner bark. It is commonly covered with a resinous varnish, to protect it from cold, insects, and moisture; and it contains the rudiments of the leaves, or flower, or both, which are to be expanded or exfoliated the following year. Buds are called by Virgil *gemmæ*. As many plants have no buds, and some that have are divested of them when removed from cold to warm climates, it is evident that the buds are not parts essential to a vegetable. They are however so very common in these northern states, that our *Flora* would appear awkward without her gems. Of the arborescent plants growing among us, which have no buds, all of them have been brought from warm climates, as the *orange*, *lemon*, *acacias*, *geraniums*, the *oleander* and *guiacum*.

If you examine a twig of almost any of our trees in December, especially the horse chesnut, you will find that the bud is rooted in or protuberates from the pith. You will also find, that wherever a new bud is generated in the stem or twig, or in the bosom of a leaf, there a membraneous diaphragm divides the cavity. This division, which is covered with a medullary or pithy substance, distinguishes the insertion of one bud from another. Beside the scales of the bark, and the rudiments of the leaves, we discover by searching deeper, that the bud, like the seed, contains the parent plant in miniature.

Seeds are vegetable eggs, and buds are fœtal plants, both equally adapted to continue their species forever. A bud on the stem or twig of a tree in winter, as well as the bulb of a tulip, is the *hybernacula*, or winter quarters, of the vegetable *ens*, where the embryo plant sleeps in safety during the severity of winter, secure from the destructive effects of frost, moisture or insects.

There are three kinds of buds; one containing a flower, another containing only leaves, and a third containing both. A just discrimination of these three kinds of buds is important to gardeners. Leaf-buds should be always selected for inoculation, although flower-buds are commonly chosen for that purpose, because they are fuller, thicker, less pointed, and resemble plump seed; whereas if they should be transplanted into the bark of a tree, they are more apt to disappoint the expectations of the ingrafter than if he used the leaf-buds. An accurate knowledge of these things will tend to explode the vague terms

of "barren buds" and "fertile buds." Another illustration of our former assertion, that anatomical investigation is the only certain and rational method of arriving at certainty in the laws of vegetation.

By the term FOLIATION, botanists mean the *complication*, or folded state of the leaves while concealed within the buds. This intricate and complicated structure was first evolved and displayed by our great master Linnæus, who has taught us, that the leaves in buds are either

INVOLUTE, that is, *rolled in*, when their lateral margins are rolled spirally inwards on both sides.

REVOLUTE, *rolled back*, when their lateral margins are rolled spirally backwards on both sides.

OBVOLUTE, *rolled against* each other, when their respective margins alternately embrace the straight margin of the opposite leaf.

CONVOLUTE, *rolled together*, when the margin of one side surrounds the other margin of the same leaf, in the manner of a cawl or hood.

IMBRICATE, when they are *parallel*, with a straight surface, and lie one over the other.

EQUITANT, *riding*, when the sides of the leaves lie parallel, and approach in such a manner as that the outer embrace the inner, which is not the case with the

CONDUPLICATE, or *doubled together*, that is, when the sides of the leaf are parallel and approach each other.

PLICATE, *plaited*, when their complication is in plaits lengthwise.

RECLINATE, *reclined*, when the leaves are reflexed downwards towards the *petiole*.

CIRCINAL, *compassed*, or in *rings*, when the leaves are rolled in spirally downwards.

Although *Lœfling's* natural history of buds has not been surpassed, as any naturalist will be convinced if he peruses his paper entitled "*Gemmæ Arborum*," in the *Amœnitates Academicæ*, yet *Darwin* is more to our purpose, which is to mix the *utile* with the *dulce*.

Dr. Darwin, in his "*Philosophy of Agriculture and Gardening*," says, "if a bud be torn from a branch of a tree, or cut out, and planted in the earth, with a glass cup inverted over it, to prevent the exhalation from being at first greater than its power of absorption;* or if it be inserted into the bark of another tree, it will grow, and become a plant in every respect like its parent. This evinces, that every bud of a tree is an *indi-*

* In this situation, a greater heat may be given them than in hot houses, without increasing their quantity of perspiration, which ceases as soon as the air in the glass is saturated with moisture.

vidual vegetable being; and that a tree therefore is a family or swarm of individual plants, like the polypus, with its young growing out of its sides, or like the branching cells of the coral insect."

"When the old oaks or willows lose by decay almost all their solid internal wood, it frequently happens that a part of the shell of the trunk or stem continues to flourish with a few healthy branches. Whence it appears, that no part of the tree is alive, but the buds and the bark and the root fibres; that the bark is only an intertexture of the caudexes of the numerous buds, as they pass down to shoot their radicles into the earth; and that the solid timber ceases to be alive, and is then only of service to support the numerous family of buds in the air, above the herbaceous vegetables in their vicinity."

"A bud of a tree, therefore, like a vegetable arising from a seed, consists of three parts—the plumula or leaf, the radicle or root-fibres, and the part which joins these two together, which is called caudex by Linnæus, when applied to entire plants; and may therefore be termed *caudex gemmæ*, when applied to buds.

"An embryon bud, whether it be a leaf bud or a flower bud, is the *viviparous* offspring of an adult leaf bud: and is as *individual* as a seed, which is its *oviparous* offspring.

"As the season advances, the leaf bud puts forth a plumula, like a seed, which, stimulated by the *oxygen* of the atmosphere, rises upwards into leaves to acquire its adapted pabulum, which leaves constitute its *lungs*. The flower bud under similar circumstances puts forth its bractes, or floral leaves, which serve the office of lungs to the pericarp and the calyx, and expand its petals, which again serve the office of the lungs to the anthers and stigmas; and thus, like the leaf bud, it becomes an adult vegetable being, with the power of producing seed."

Close observers of nature have remarked, that about midsummer there is a kind of pause in vegetation, for perhaps a fortnight; and it is believed that leaf buds may be changed into flower buds, and flower buds into leaf buds. The probability of this idea of transmuting flower buds and leaf buds into each other is confirmed, says the ingenious author of "The Flower Garden," by the curious conversion of the parts of the flowers of some vegetable *monsters** into green leaves, if they be *too well* nourished after they are so far advanced as to be unchangeable into leaf buds. Instances of this luxuriance are sometimes seen in the chaffy scales of the calyx of the *everlasting*, in the *pink*, and in the *rose willow*. The artificial method of

* Double, or very luxuriant flowers, however beautiful in the eye of the florist, are called monsters by botanists.

converting leaf buds into flower buds, is by disturbing the natural course of vegetation, by binding some of the most vigorous stalks or roots with strong wire. The success of this operation depends on weakening or strengthening the growth of the last year's buds.

Instead of planting buds in the earth, we plant them *within* the bark of another tree; taking care to place them so that the pith of the bud comes in close contact with the pith of the branch, in which the slit is made. This mode of propagation is called inoculation.*

An argument, among others, that the Chinese had no communication with either Greeks or Romans, is their total ignorance of the art of ingrafting or inoculation.

THE LEAF.

So from the root
Springs lighter the green stalk; from thence the LEAVES
More airy; last, the bright consummate flower.

His praise, ye winds, that from four quarters blow,
Breathe soft or loud; and wave your tops, ye pines?
With every plant, in sign of worship, wave?
O, universal Lord? be bounteous still,
To give us only good; and if the night
Have gather'd aught of evil—
Disperse it, as now light dispels the dark.—*Milton.*

By *foliation*, English botanists mean the *complication* or folded state of leaves, while concealed in the bud; but this term expresses not that procedure of nature by which the leaves are renewed and developed every spring, so accurately as does the Latin word *vernatio*.

We have shown, that the bud springs from the medulla, or pith of the plant; and by searching into the bud we have seen the rudiments of the leaves; and when we penetrate still deeper, we discover that the bud, like the seed, contained the epitome of the future plant; but during winter it wants the power of unfolding its parts. Both seeds and buds contain the *primordia plantarum;* buds therefore differ from seeds, only as the living fœtus differs from the egg of the animal; so that buds are seeds in a more advanced stage of vegetation. We have already remarked, that some buds contain flowers, some leaves, and some both; and that an accurate discrimination of them was of importance in the process of *budding*. To watch the *vernation* of the embryo bud, the gradual unfolding of the fœtal leaves and infantile flower, is a pleasing speculation; for

* In France and in Switzerland they improve the fruit of a tree by ingrafting it with a scion from its own branches. This is found to ameliorate the quality of the fruit, and increase the size of it.

the leaves are completely formed, and fairly rolled up for evolution, many months before they begin to expand. The study of the anatomical structure of the full expanded leaf is equally delightful.

We shall pass silently over the nomenclature of leaves, which is apt to discourage young botanists, unused to geometrical writers in the Latin tongue, and shall pursue the more pleasant task of exhibiting, as far as we are able, the structure and the functions of the leaf.

When we are told that "a leaf is a part of a plant, extended into length and breadth, in such a manner as to have one side distinguishable from the other," the naturalist receives but little information; and we obtain but little more, when we are told that they are "the organs of motion;" but when we say, that the leaves are the *lungs* of a plant, we convey an idea more consonant to truth and nature; for we find that a leaf will die if its upper or varnished surface is annointed with any glutinous matter, or when placed in an exhausted receiver. If we should say, that the leaf combines the office of *lacteals* and lungs, we shall come still nearer the truth. While our stomachs digest solid food, our lungs digest air; so that what is performed by two organs in animals, is performed by one in plants. Let us then examine this organ and its functions.

The leaf is attached to the branch of the plant by a short foot-stalk. From these foot-stalks a number of fibres issue, which, ramifying in every direction, communicate with each other in every part of the leaf, and thereby form a curious network. The intermediate substance is greenish, and may be eaten by insects or destroyed by putrefaction, while the fibrous part remains entire, constituting the skeleton of the leaf. There are, however, two layers of fibres in every leaf, forming two distinct skeletons, the one belonging to the upper part of the leaf, the other pertaining to the lower. It is very difficult to demonstrate the anatomy of a leaf; but we have reason to conclude that the seven essential parts of a plant enumerated are extended, rolled out, and extenuated throughout the leaf; so that if you slit a leaf with scissors, you cut through as many different parts of the plant, as if you cut through the trunk of a tree. The whole leaf is covered with a portion of the epidermis, or the scarf-skin, which covers the stem and stalk of the plant. Between this thin membrane and the corticle net work are placed the absorbent vessels, together with what we presume to be the absorbent glands. Dr. Darwin assures us, that there is an artery and a vein in a leaf, and that the artery carries the sap to the extreme surface of the upper side of the leaf, and there exposes it, under a thin moist membrane, to the action of the atmospheric air; then the veins collect and return this cir-

culating fluid to the foot-stalk, just as the artery and vein operate in our lungs. It is hardly fair to compare the leaves of a plant with the respiratory organs of the more perfect animals; but rather to the breathing apparatus of insects, or, what is perhaps more to our purpose, to the *gills* of fish.

When the structure of any organized body is too subtle to come within the scrutiny of the human senses, we must have recourse to analogy; and from the truths we discover, and the observations we make, we must judge of the operations in similar bodies; for we can form our opinion of that we know not, only by placing it in comparison with something similar to what we do know. The structure of certain large leaved plants that grow in water is remarkably conspicuous; and the gills of fish resemble, in structure and office, the leaves of these aquatic plants. Duverny and Monro have scrutinized the gills of fish; the former found that those of a carp contained *four thousand three hundred and eighty-six* bones, which were moved by sixty-nine muscles: and the latter informs us, that in the gills of a skate fish there exists *one hundred and forty-four thousand* folds, or subdivisions. This manifold structure gives this respiratory organ a surprising extent of surface. These subdivisions, terminating in innumerable points, resemble fringe, but when examined by the microscope appear like down; yet is every part crowded with blood vessels, being ramifications of the pulmonary artery and vein. The whole extent of the gills is covered by an exceedingly fine membrane, in which the microscope discovers a still finer net-work of vessels. By such a structure the fish exposes a greater surface of blood to the water, than is exposed to the air by the internal membrane of the air cells of the lungs of quadrupeds; and that for the same purpose, namely, imbibing uncombined oxygen, which is the material, or *pabulum vitæ*, equally necessary to fish as to land animals. Now, if we compare the structure of the gills of fish with that of the leaf of aquatic plants, we can discern a great similarity.

The gills of fish present an immense surface to the water in which they live, in consequence of their innumerable folds of nerves, blood and air vessels. The divisions and subdivisions of this organ are so fine that they resemble a most delicate fringe. In like manner certain aquatic plants, growing in the ponds in this vicinity, have subaquatic leaves, resembling fine moss, or rather that kind of silk called *floss*, the structure and use of which are the same as the gills in fish. While those leaves, which are growing under water, have this delicate structure, the leaves of the same plant, when it has shot up out of the water, being produced wholly in air, become entire and firm, having none of those segments or slits which distinguish

them when subaquatic ; so that the one leaf under water has the structure and function of gills, while the next above it is a firm leaf, or lungs, by reason of its breathing the open air. Here a change takes place in an amphibious plant, like that which is observed in an amphibious animal on its passing from the tadpole to the frog state ; for in the former state it has gills and in the latter lungs.

As a tree cannot go in search of food, like an animal, it is forced to draw its nourishment from within the narrow sphere of its existence ; it therefore extends its roots through the surrounding earth, by which it draws in sustentation, as through so many syphons. These imbibing vessels of the roots may be compared to the *lacteals* in animals. This chyle, or sap, ascends to the leaves, and is there changed into a more perfect fluid, answering to the blood of animals ; it is still further exalted in the flower, in order to perfect the seed and continue its kind. The roots are sufficient to supply nourishment to a large tree during winter, when divested of its leaves, and when the vegetative life reposes in winter quarters : but stimulated by the warmth of spring, the vegetable *ens* awakes ; and when the process of *vernation* has fairly begun, then the tree has no more to do than merely to support its own existence, and therefore it spreads through the air its numberless leaves, which are nearly equivalent to the stomach and lungs of animals.

That the sap ascends to the leaves, is proved by the bleeding of vines early in the spring, before the leaves are formed, there being no leaves to receive it ; but when these elaborate organs are formed the vine ceases to bleed, because the sap flows into them for *rectification* ;* for while a vegetable is growing it is continually going through a regular series of changes, losing the properties of one substance and assuming those of another ; thus mucilage in a young plant becomes starch in the old ; what in green fruit is acid, in a ripe fruit is sugar.

But the function of the leaf is not perpetual and uniform, as in the lungs of the more perfect animals ; its operations differ in the day and in the night. In the day, the leaves of plants exhale moisture and *oxygen gas* ; but during the night, they emit *carbonic acid gas*, and absorb *oxygen gas*. In plainer terms, they exhale, in the light of the sun, salutary or vital air ; but in the dark they emit a noxious air. One of these operations is performed by the varnished side of the leaf, and the other from the rough or under side. This varnish of the leaf is found to be bees-wax.

As air and heat are necessary to the life of a plant, so is *light*

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* *Rectification*, in the language of chemists, means drawing any thing over again by distillation, to make it yet higher and finer.

to its health.* The want of light prevents a plant's forming its proper juices, deprives it of its green color, and prevents the impregnation of its seed. It is the smooth side of the leaf that is acted upon by the light; and is that part by which a plant in a great measure lives; hence the *leaves* of many delicate plants shut up, so as to cover this smooth side on exposure to noxious vapor, or darkness, or to screen it from an extremely fierce sunshine. In order to make a distinction between the *sensation* of heat and the *cause* of it, the word *caloric* has been adopted. Caloric is a body, and so is light. The sun is the source of both; for he emits two kinds of rays, one *calorific*, the other *colorific;* the first occasions *heat*, the other *color*.

With what different eyes do the philosopher and the uninformed husbandman view a tree, waving in the full glory of its luxuriant foliage! Ask the woodsman for what a tree was made—he will tell you, to bear nuts, to be cut into boards, to burn to keep him warm, and to cook his victuals. Ask the naturalist, and he will tell you, that they are an important, nay indispensable link in the chain of human existence; insomuch that were the Parent and Legislator of nature to cause every vegetable on earth at once to be annihilated, the atmospheric air would directly become a putrid mass of every thing that is noxious, and man, and other terrestrial animals of similar construction, would soon turn into a mortified lump of corruption. The leaves of all sorts of vegetables are in fact so many laboratories for purifying the air we breathe.

During winter, when the surface of the earth is bound up with frost, encrusted with ice and covered with snow, little or no putrefaction takes place; then the vegetable kingdom appears as if dead; the trees, divested of leaves, seem like so many dead sticks; but when the sun begins to diffuse its warmth over the earth, promoting that general tendency to corruption to which all dead bodies are liable, then the trees soon exhibit

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* It is remarkable, that the leaves cannot prosper without *light;* yet seeds germinate best in the *dark*.

LIGHT is an elastic fluid, that is reflected from certain bodies which it cannot penetrate; it is also possessed of chemical affinities, by which it enters into combination with other substances; sometimes occasioning their decomposition, and sometimes it is extricated from its combinations. It gives to vegetables their color, and contributes to their smell, and balsamic principle. It enables the leaves of vegetables to emit streams of *oxygen gas*, or pure *vital air*.

OXYGEN, or the *acidifying* principle, is found only in its combinations. The *oxygen gas* is the result of the combination of oxygen with *caloric*. It exists in atmospheric air, in the proportion of 27 to 100, and is heavier than the air of the atmosphere. It is absolutely necessary to respiration—hence termed VITAL AIR. During the action of breathing, it enters our blood by the vessels of the lungs, giving to it a vermillion color, and an augmentation of vital powers.

a pleasing scenery, and the leafless branches, by bursting their buds, and by displaying all at once their foliage, increase their surfaces many thousand times. The leaves are so arranged on the branches as to expose their varnished surface to the direct influence of the sun; and if forced out of that position they will turn themselves; for leaves are more greedy for the light of the sun than for the influence of heat.

It is from the under or rough side of the leaf, that the *azotic* or rather *carbonic acid gas*, or unwholesome air, is emitted; while the *oxygen gas*, or pure vital air, emanates from the upper or smooth varnished surface; but not before the sun has shone some time upon it. This distillation of pure vital air by the leaf diminishes towards the close of day, and ceases altogether after sunset, when unwholesome air is emitted by the rough side of the leaf; and the next day, soon after the rising of the sun, the smooth or upper side recommences its function. Hence we see the reason why it is unhealthy to tarry in the deep shade of the forest during the night. "*Surgamus*," says the shepherd in Virgil, "*solet esse gravis contantibus umbra.*" *Let us rise, for the evening shade is unhealthy to singers;* and he adds, even the juniper is *now* noxious. Ill-scented and even poisonous plants equally afford salubrious air in sunshine.

It is remarkable, however, that while leaves are performing this salutary process, *flowers* render the surrounding air noxious even in the day time. The effluvia of a large quantity of gathered fruit, has at all times a deleterious quality. A peach, in a few hours, rendered a body of air, six times its own bulk, so entirely poisonous, that an animal could not breathe, nor a candle burn in it. A rose kept in a glass, so much infected the air as to render it unfit for respiration. Persons have been found dead in their beds, whose lodging rooms had been crowded with flowers; others have been suddenly affected with dizziness, nausea, and head ache, on going into a green-house of flowers that had been shut up closely during the night.* While a growing vegetable is capable of this two-fold operation, it absorbs whatever putrescent particles it finds in the surrounding earth and air. A sprig of mint put into a jar of air rendered foul by animal putrescency, though faded, will revive, and grow surprisingly; and will moreover correct air, so that an animal shall be able to breathe in it.

Here is the proper place to remark, that the ocean when agitated by winds, yields oxygenous gas; and the azotic, mephitic

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* Ingenhouz placed twenty-four French beans in a quart jar, which rendered the air, in one night, so poisonous, that a chicken, put into it died in about twenty seconds.

or noxious air, is corrected by being strongly shaken with water. Hence we learn that the two grand correctors of the atmospheric air are, first, the *agitated ocean*, and secondly, *living vegetables while operated upon by the rays of the sun.*

If we reflect upon what has been said, it will appear that plants have their *private virtues*, and their *public* ones. Besides the peculiar medicinal and nutritive qualities which some possess, the great family of plants, or what is called the vegetable kingdom, conspire to form one grand apparatus for purifying the atmosphere and rendering it fit for respiration; these may be called their *public* virtues. In this view, no vegetable grows in vain, whether in the interior of this vast continent or in the wilds of Africa; for the leaves of all, whether ill scented, acrid or poisonous, elaborate the air they contain, and pour down a shower of depurated oxygenous or vital air, which, diffusing itself through the common mass of the atmosphere, renders it more fit for animal life. In this salutiferous process, the fragrant rose and the violet, the deadly night-shade and the still more deadly laurel, co-operate. The animal and vegetable kingdom operate on each other. Putrid animal effluvia, noxious to man, is food for plants; while plants transmit a salutary air to man.

The winds convey vitiated air from us, for our relief; and they return salubrious gales, for our refreshment; "and if these salutary gales rise to storms and hurricanes, let us trace and revere the ways of a benificent BEING, who, not fortuitously, but with design; not in wrath, but in mercy, shakes the waters and the air together, to bury in the deep those putrid and pestilential effluvia, which the vegetables on the face of the earth had been insufficient to consume."

These traits of wisdom, visible in the economy of those departments of nature which have come under our scrutiny, clearly instruct us how kindly PROVIDENCE restrains, impels, and directs all things to a beneficent end, but in no instance is it more apparent than in the rays of the sun correcting, through the agency of the leaves of vegetables, the noxious influences of the night.

WATER.

Resistless, roaring dreadful, down it comes,
From the rude mountains, and the mossy wild,
Trembling through rocks abrupt, and sounding far;
Then o'er the sandy valley floating spreads,
Calm, sluggish, silent; till again constrain'd
Between two meeting hills, it bursts away
Where rocks and woods o'erhang the turbid stream,
There gathering triple force, rapid and deep,
It boils and wheels, and foams and thunders through;
——Till pouring on, it proudly seeks the deep;
Whose vanquish'd tide, recoiling from the shock,
Yields to this liquid weight of half the globe. *Thomson.*

It is asked, "*Is this season, so full of the bloom of nature, unpropitious to the unfolding of the petals of elocution?*" Let the great Montesquieu answer the question. Put a man, says this sage, in a warm, confined place, and he will feel faintness and lassitude. Thus circumstanced, if you propose a bold enterprise to him, you find him very little disposed towards it. His weakness will induce a despondency; he will be afraid of every thing, because he feels himself capable of nothing. Faintness of body, produced by the heat of the climate, is soon communicated to the mind; and then there is no curiosity, no noble enterprize, no generous sentiment. The inclinations are passive, and indolence constitutes his utmost happiness.

Although the botanist has been ready to exclaim with Thomson,

All-conquering heat, oh intermit thy wrath!

yet he has not been an idle spectator of the transitory blossoms.

For as the vernal sun awak'd the torpid sap,

he watched the infant bud and embryo flower; and marked, as they gradually unfolded, the beauties of the breathing leaf. And when the bursting calyx gave the struggling petals to the admiring sight, he hung over their elegant forms and resplendent hues enraptured. But while gazing at the glories of the full blown flower, and contemplating its wondrous economy, it shrunk from the intrusion, and, like the hopes of man, withered on the stalk. So passeth away the splendor of this world!

During dry and fervid seasons, the vegetable race has a more melancholy aspect, than in the frozen gloom of winter, when the vegetative *ens* naturally retires to its cradle, *hybernacula*, or winter quarters, and is resuscitated by the next vernal sun. But in this arid and adust state of the earth and the air, every annual plant is threatened with speedy destruction: For want of the cherishing influence of supernal rain,

Distressful nature pants.
The very streams look languid from afar. *Thomson.*

To the laborious husbandman, the gardener, and the botanist, the descent of rain on the parched soil and thirsty plants is the

most grateful phenomenon in the whole economy of nature. Let us put by our flowers then, for the present, that we may consider the nature, and contemplate the source of this precious fluid, which gives health, beauty and vigor to all that lives.

Indeed water is a wondrous element! Well might the Grecian sage contend, that water was the original matter, or principle of all things; and that even the air was but an offspring, expansion, or expiration of water. We actually find that water bears a part in the formation of every body in the three kingdoms of nature. It enters into all the food of every animal, and every vegetable in creation. It is necessary to the free exercise of every animal function and action: and although it is the common cement of all terrestrial bodies, it nevertheless hastens and facilitates the requisite dissolution of every animal and vegetable, when life has departed; and is therefore an important agent in that never ceasing process of mutation, by which one thing is changed *out of*, and *into* every other in creation.

Can a Naturalist do better, than solicit the attention of his young readers of both sexes, to the means nature uses to provide the earth with rivers of water; beasts with running brooks; plants with refreshing showers; and man with every thing? It is possible that they may never once have reflected on *the connexion between the sea and vegetation*—between the mountains and the ocean—between the rivers under ground and the atmosphere above it. They may never have considered, that the Atlantic ocean conspires with our loftiest mountains to furnish us with an element indispensably necessary to the life, to the health, and to the beauty of plants, as well as of men.

The clouds dispensing refreshing showers, "turning the wilderness into a standing water, and the dry ground into water springs;" the flow of rivers, with their long train of beneficial consequences, could hardly escape the notice of any thinking being in any age of the world. We accordingly find the supply of water frequently mentioned, in the oldest book we have, among the most wonderful, as well as valuable of Heaven's blessings; whilst the heathen world imagined every river to be under the guardianship of some particular deity, who they believed created it, because they knew a river of water to be of more than mortal formation.

It has probably impressed others, as well as the writer, with something bordering on wonder, that during seven and twenty centuries, wherein the memory and learning of mankind have been exercised, there has not been found one philosopher so well instructed in the laws of nature, as to be able to give a complete history and satisfactory explanation of *the ascent of fresh water from the salt ocean; the suspension of vapors in the air;*

the formation of distinctly defined clouds; and the descent of rain, together with a connected chain of causes. What facts and reasonings we have on these subjects are mere fragments widely scattered.

Seeing the earth covered annually with a rich and beautiful carpet of vegetables; and these surprisingly diversified, variegated, and developing between "seed time and harvest time," must have led those of ancient days to recognize the proximate cause, the warmth of the sun and the moisture from the clouds; and these again to that perpetual circulation subsisting between the ocean and the mountains, through the instrumentality of the air, and by the medium of rivers to the ocean again. But the philosophy, or explanation of this vivifying phenomenon is spoken of as something past finding out. They did then, as we do now, push our investigations as high as ever we can, as in the case of gravitation; and beyond that principle say with them, it is "*the hand of God;*" an expression denoting only the last term of our analytical results. Unable to discover the essence of *light* and of *fire*, the DEITY was called by the name of these inscrutable agents.

In early times, when the knowledge of nature was confined to narrow limits, they, like our Indians,

"Saw God in clouds, and heard him in the wind."

Hence they styled the DEITY, "*the father of the rains*," and represented him, as "*calling forth the waters of the sea, and pouring them down according to the* VAPOR *thereof*." Whence we infer that they believed that the water rose, in form of *vapor* from the salt ocean; and that it became freshened in its passage through the air. It moreover appears, that they believed that this process was regularly and perpetually performing, in an unceasing circulation; for they remarked that, although "*all the rivers run into the sea, yet was the sea not full; unto the place whence the rivers come, thither they return again*." They seem also to have known, that *mountains* made a part of this grand apparatus; and to have believed that it was not a fortuitous or casual operation; but regulated as we now find it, by weight and measure. May not this be inferred from the sublime question of Isaiah—"*Who hath measured the waters in the hollow of his hand, and weighed the* MOUNTAINS *in scales?*"

The people of ancient times discerned in part this magnificent apparatus; and saw its effects; but were restrained by a religious awe, from attempting the investigation of it; because *storms*, *lightning*, and *hail*, were conceived to be the precursors of the chariot of the DEITY;—"*Who maketh the clouds his chariot—who walketh on the wings of the wind*," accompanied

with "*hail stones*" *and* "*fire*." The origin and the course of the winds, "*whence they come, and whither they go*," were all for these reasons deemed mysterious. Hence, instead of scrutinizing the cause, their pious minds, overwhelmed with awe, sunk into undiscerning amazement. Under such solemn impressions, I cease to wonder, that he who wrote that ancient drama, the book of *Job*, puts, among the most difficult of his questions, that which demands an explanation of "*the balancing of the clouds*."

The never-ceasing circulation of water between the ocean and *terra firma* has, it seems, been contemplated from the earliest ages with grateful admiration ; but not being altogether an object of sight, was ranked among the inexplicable works of Deity.

Des Cartes, *Niewentyte*, *Halley*, and a few others among the moderns, have amused the literary public with their hypotheses; but of their learned theories, which of them is not clogged with objections? That all the rivers of fresh water are derived from the salt ocean, no one doubts ; but how it rises from the sea is the question. Some contend, that the particles of water are formed into hollow spherules, or diminutive balloons, which being lighter than common air, ascend and are buoyant in it ; and that they rise or fall, or move horizontally, according to the impulse given by attraction, repulsion, by winds, or by electricity. The public have generally acquiesced in the theory of Dr. Halley, as they commonly do with every hypothesis presented them in the imposing garb of mathematics. Dr. Halley took a vessel of certain dimensions, filled to a certain depth with water, and warmed to such a degree as the air is in the hottest summer months. After standing two hours, he found on weighing it what it had lost by evaporation. From this datum he proceeded in his calculations, and found that a square mile yields six thousand nine hundred and fourteen tons, and consequently that a degree square will evaporate about thirty-three million of tons. He calculated the surface of the Mediterranean, and estimated that it must lose in vapor every summer's day *five thousand two hundred and eighty million of tons*. Dr. Halley considers a certain grade of heat absolutely necessary to the ascent of vapors from the ocean ; but we find that this evaporation goes forward with equal rapidity in the coldest weather, nay in caves at the coldest season, in the frozen regions of the north.

> Strange ! what extremes should thus preserve the snow,
> High on the Alps, or in deep caves below.—Waller.

We must then seek some other cause beside *heat ;* and the chemico-philosophers have tried to soothe disputants by an hypothesis which is void of it. They consider that the air is a *men-*

struum, capable of dissolving, suspending, and intimately mixing the particles of water with itself. That as a given quantity of water will take up just so much salt and no more, without becoming turbid, and at length precipitating it to the bottom, so air, the most powerful solvent in nature next to fire, will take up, intimately mix, and suspend, just so much water, and remain clear. The mixture will continue transparent just this side saturation; when *saturated*, the abundant waters float in form of clouds; but when *supersaturated*, it lets go the water, which, like a supersaturated solution of salt, falls from the clouds on the earth in the form of rain.

Is the probability of this theory diminished by the new chemical doctrine, which teaches that water is formed by an union of *hydrogen* and *oxygen*? The pneumatic chemists have, by their curious discoveries, removed the boundaries which separated, as we once thought, air from water, and have led us to respect that very ancient idea which conceived them to be *one* element.

The salt ocean, which covers by far the greatest part of this globe, has a three-fold motion. The first is gentle, like the breathing of an animal; by it the sea swells and rises up against the shores, and enters gradually the bays and mouths of rivers, during the space of six hours. Then it seems to rest for a quarter of an hour, and then as gradually slides down again; when, after another pause of a quarter of an hour, it begins to flow again as before. The second motion is more vehement and incessant, and is like that of the heart, circulatory; whereas that of the tides is merely backward and forward. It comes in the course of the trade winds, which blow everlastingly from east to west—runs past the West India islands—pours into the bay of Mexico—and rushing rapidly out forms the gulf of Florida; which sweeping along the American shore carries the waters of the Atlantic into the North Sea, whence they pass in a never-ceasing circulation around the globe.

The other motion is from the atmosphere, when agitated by winds. It is local and variable, and seems subservient to the transpiration of the ocean. It ruffles the surface merely, and from this superficial agitation begins that hitherto inexplicable *distillatio per ascensum*.

By whatever means the water ascends into the air from the ocean, this is briefly the course of it; in rising from the ocean it leaves the salt behind, as in the common process of distillation. The ascended vapor is probably decomposed, when it forms clouds which are distinctly visible; these float in the general atmosphere, which appears to be then a different fluid from these circumscribed clouds. Antiquity conceived a cloud to be a congeries of watery vapor, a conservatory, in which the

rain is kept as "in bottles." As clouds become fuller of water they gravitate, or are attracted by the loftiest mountains, when they pour upon them their abundant rains. But, according to an ingenious chemist, there are two steps in the process between evaporation and rain, of which at present we are completely ignorant:

1st. What becomes of the vapor after it enters into the atmosphere?

2d. What makes it lay aside the new form, which it must have assumed, and return again to its state of vapor, and fall down in rain?

And till these two steps be discovered by experiments and observations, it will be impossible for us to give a satisfactory or a useful theory of rain. There are mountains so very large, that even provinces are found embosomed near their summits, as those of Quito. The tops of such mountains are constantly enveloped with clouds, especially during the night,* and the waters are constantly dripping down through the crannies and crevices of the stones, forming kindred brooks; when, uniting with other streams, it rushes with accelerated force to the plains below, forcing a passage through every pliable thing in its way.

The river, after rolling its waters into the ocean, is destined to be again exhaled in vapors, and to re-enter afresh the channels of this magnificent circulation!

FLOWERS.

> "Last, the bright, consummate FLOWER,
> Spirits odorous breathes."—*Milton.*

We hail with gratitude the returning of spring! In winter when the earth is bound up with ice, and covered with a bed of snow; when the trees are divested of their leaves, and appear dead, and the very herbage seems annihilated, then "the lord of the soil" casts his eyes over the barren waste with a sigh. As his reason alone could not lead him to believe that the tree would ever again blossom, or the earth be again clothed with a beautiful carpet of vegetables; so his heart sinks within him, from a fearful apprehension that the LORD OF ALL is unmindful of his necessities. This, ye Legislators! is the period when you should, in imitation of the churches of Rome and of England, appoint your days of *humiliation* and *solemn fasts;* for it is at this gloomy season that man feels his dependency on a *power above him.* But when the sun so diffuses its warmth through the air as to loosen the flinty brook, and edge it with green; and when the full-bladed grass appears, and awakened nature

* It rains perpetually among the Andes, while in Egypt seldom or never.

sees a new creation, then the husbandman exclaims with exultation, "*Man is not forgotten!* for here and there are pledges of an adorable reminiscence, and traits of a wonderful renovation!"

If in winter the husbandman

> "Marks not the MIGHTY HAND
> That, ever busy, wheels the silent spheres,"

he cannot miss it in

> "The fair profusion that o'erspreads the spring."

The poets have conveyed their idea of spring, by describing this genial season as a youth of most beautiful air and shape, with a blooming countenance, expressive of satisfaction and joy, and clothed in a flowing mantle of green, interwoven with flowers; a chaplet of roses on his head, a *narcissus* in his hand, while primroses and violets spring up under his feet.* The ornament and pride of spring, Milton's "bright, consummate flower," must therefore be our present theme.

Every one may think he knows precisely what is a *flower:* it is however remarkable, that botanists have been not a little puzzled in fixing their definition of it. The celebrated French botanist Tournafort tells us, that "a flower is a part of a plant, very often remarkable for its peculiar colors, for the most part adhering to the young fruit, to which it seems to afford the first nourishment, in order to explicate its most tender parts." Is this a definition? Pontedra, in his Anthology, tells us that "a flower is a part of a plant, unlike the rest in form and nature." Jussieu says, "that is properly a flower, which is composed of stamina and of a pistillum." But some flowers have no pistillum. Vaillant advanced one step beyond his predecessors, and asserts, that "the flower ought, strictly speaking, to be reckoned the organs, which constitute the different sexes in plants; for that the petals which immediately envelope them are only the coats to cover and defend them;" but he adds, "these coats are the most conspicuous and most beautiful parts of the composition; and therefore to these, according to the common idea, shall I give the name of flower." Martyn went a little farther, and deefined "a flower to be the organs of generation of both sexes, adhering to a common placenta, together with their common coverings." Nay, if we consult Johnson's Dictionary for a definition, we shall find that "a flower is that part of a plant which contains the seeds"—which definition is more applicable to a pea-pod. The early botanists meant by the term *anthos*,

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* The poets have described Spring; accompanied by Flora on one hand and Vertumnus on the other, and immediately followed by a stern figure in shining armor. This is *Mars*, who, they say, has long usurped a place among the attendants of Spring.

flos, or *flower*, what is now understood in common conversation by that term, namely, the rich and delicate painted leaves or petals which adhere to the seed vessel, or rudiment of the future fruit. In truth, botany was unknown to the ancients as a science. They had no distinct term to express the petals of a flower, so as to distinguish it from the green leaves of the plant. Virgil, in describing his *amellus*, which is a species of aster, the flower of which has a yellow disk and purple rays, calls it a golden flower surrounded with purple leaves. All his translators, excepting Martyn, the botanist, have mistaken his description.

Addison makes the *leaves* of the plant purple, Dryden makes the *bough* purple, and Trapp gives the *stem* a golden hue. All this confusion has arisen from the want of a word in the Latin language to express the *petals* of the corolla, as distinct from the common *leaves* of the plant.

Since the adoption of the sexual system, the petals, which excite the admiration of the florist, are considered by the botanist as coverings only to the essential parts of the flower. A flower, therefore, in modern botany, differs from the same term in former writers, and from the common acceptation of it; for the calyx, the petals, nay, the filaments of the stamina, may all be wanting; and yet it is a flower, provided the anthers and stigma can be traced. The *essence* of a flower, then, consists in the anthera and the stigma; and they constitute a flower, whether they be supported by a calyx, or surrounded by a petal or petals, forming that chaplet, coronet, or little crown, denominated in Latin *corolla*. A patient observer may find these nice distinctions illustrated in *ferns*, *mosses*, *mushrooms*, *linchens* and *sea-weeds*.

Let us now examine a complete or perfect flower; and let us first look at

The Calyx: which originally meant the green bottom of a rose bud; but it is now extended to that green flower cup, which is generally composed of five small leaves, and which encloses, sustains and embraces the corolla, or painted petals, at the bottom of every flower, and indeed envelops it entirely before it opens, as in the rose. The calyx which accompanies almost all other flowers, is wanting in the tulip, the hyacinth, the narcissus, and indeed the greater part of the liliaceous tribe. The admirably accurate *Grew* called this part of the flower the *empalement*, and defines it to be the outermost part of the flower, compassing the other two, namely, the corolla, or what he called the *foliature*, and the stamina and pistillum, which he called the *attire*.

The terms *perianthum*, *involucrum*, *amenthum*, *spatha*, *gluma*, *calyptra* and *volva*, are but different appellations of the varied calyx. Linnæus tells us, that the calyx is the termination of the cortical epidermis, or outer bark of the plant, which, after accompanying the trunk or stem through all its branches, breaks out at the bottom of the flower, in the form of the flower cup. In the sexual system, or, as some will have it, the allegory of the illustrious Swede, the calyx is rarely of one entire piece, but of several, one laid over the other. This structure serves to keep the whole flower or composition tight, and at the same time allows it to recede as the parts of fructification increase in size. It is like slackening the laces of the stays, stomachers, or bodices, in cases and circumstances not entirely dissimilar. Flowers standing on a firm basis, as tulips, have no calyx; but where the foot of each petal is long, slender and numerous, as in pinks, they are kept within compass by a double calyx. In a few instances, the calyx is tinctured with a different color than green, and then it is not easy to distinguish the painted calyx from the painted corolla. Linnæus, however, gives this simple rule—the corolla, in point of situation, is ranged *alternately* with the stamina, whereas the segment of the calyx stands opposite to the stamina. Thus much for the calyx.

The COROLLA is the circle of beautiful colored leaves which stand within the calyx, forming a chaplet, composed of a petal or petals; for so we call those delicately painted leaves, which excel in beauty every other part of the plant. In the piony, the petals are blood red; in our garden lily, a rich and delicate white; and in tulips and violets, charmingly variegated. The number of petals in a flower is to be reckoned from the base of the corolla, and the number of the segments from the middle of it. If the petals are quite distinct at the bottom, the flower is said to be polypetalous, or to consist of more petals than one; but if the petals be united at bottom, though ever so slightly, then the flower is monopetalous, or consisting of one petal only; thus the cranberry is monopetalous, and not tretapetalous, because, though the petals fall off in four distinct parts, they were originally united at the base. A bell-shaped flower consists of one petal, and is denominated *corolla campanulata*, and a funnel-shaped flower, *corolla infundibuliformis*; a gaping flower, *corolla ringens*: but the *corolla cruciformeris* consists of four petals; and the butterfly-shaped flower, or *corolla papilionacea*, consists of five petals, as in the pea blossom. The number *five* is most remarkably predominant in the petals of flowers.

There are, moreover, irregular flowers, consisting of dissimilar parts, which are generally accompanied with a *nectarium*,

as in the larkspur. The nectarium, so called from nectar, the fabled drink of the gods, is that part or appendage of the petals appropriated for containing, if not secreting, the honey, whence it is taken by the bees. All flowers are not provided with this receptacle for honey, although it is probable that every flower has a honey secreting gland. The irregularity of the form and position of this receptacle frequently puzzles young botanists. Sometimes the nectarium makes part of the calyx; sometimes it is fixed in the common base or receptacle of the plant. Plants in which the nectaria are distinct from the petals, that is, not lodged within their substance, are generally poisonous. If the nectarium do not exist as a distinct visible part, it probably exists as a pore or pores in every plant.* It may hereafter be demonstrated, that this secretory apparatus is primarily necessary to the fructification of the plant itself. Rousseau says, that the nectaria are one of those instruments destined by nature to unite the vegetable to the animal kingdom, and to make them circulate from one to the other. A flower and an insect have great resemblance to each other. An insect is nourished by honey. May it not be needful that the flower, during the process of fructification, should be nourished by honey from the nectaries? Sugar is formed in the joints of the canes, for perhaps a similar purpose.

THE STAMINA, AND THE PISTILLA.

Within the corolla stands what Grew called the *attire;* but what are now called the *stamens* and *pistils*, which in the sexual system and Linnæan hypothesis of generation are the most important organs of a plant; for on the number and respective position of the stamens and pistils, that prince of botanists has founded his famous *sexual system.*

The *stamina* are filaments or threads issuing from about the middle of the flower. Each stamen or thread is surmounted by a prominence or button, containing a fine powder. This protuberance is called the anthera, which is a capsule with one, two, or more cavities. The summit of each stamina is called by way of pre-eminence, *anthera*, or *flower*. It contains the *pollen*, which term means in Latin the very fine dust in a mill. Some conceive this dust to be infinitessimally small eggs or seeds, or rather organic particles, or *molecules;* others compare it to the seminal fluid in animals. This pollen, or fecundating powder, is very conspicuous in the tall, white garden lily. This powder is collected by the bees, and is formed by some secret process in their bodies into wax, which is a singu-

* All the *grasses* have nectaries. In the Passion flower it is a triple crown or glory.

lar species of vegetable oil, rendered concrete by a peculiar acid in the insect.

The *pistillum*, which is the Latin word for a pestle, stands in the centre of the flower: this term has been adopted, from the fancied resemblance of a pestle in a mortar. It is placed on the germen, or seed bud; its summit is called stigma, and in many flowers resembles that bone of the arm denominated the *os humeri;* but its form varies in different kinds of flowers. The surface of the stigma is covered with a glutinous matter, to which the fecundating powder of the anthera adheres.

The *germen* is then the base of the pistillum, and contains the rudiments of the seed, which in the process of vegetation swells and becomes the seed vessels. It answers to the ovarium, or rather uterine apparatus of animals. The pericarpium is the germen grown to maturity, or the plant big with seed.

The *receptacle* is the base, which connects the before mentioned parts together.

Fructification is a very significant term; it is derived from *fructus*, fruit, and *facio*, to make. We are not entirely satisfied with the definition which our great master has given of this compound word; he says, it is a temporary part of plants appropriated to generation, terminating the old vegetable, and beginning the new. We have just described the seven parts of fructification; when recapitulated, they are in order as follows:

I. The Calyx.
II. The Corolla.
III. The Stamina.
IV. The Pistillum.
V. The Germen, or *Pericarpium*.
VI. The Seed; and
VII. The Receptacle.

Having described the seven several component parts of that beautiful offspring of a plant denominated a *flower*, we have now leisure to make a few remarks on the whole composition.

We cannot readily believe, with most botanists, that the petals, or to take them collectively, the corolla, have no other use in the vegetable economy than merely to cover and guard the sexual organs. It militates against one of the most conspicuous laws of nature, where we never see a complicated contrivance for a simple end or purpose, but always the reverse. There is a pulmonary or *breathing* system in every vegetable. An artery belongs to each portion of the corolla, which conveys the vegetable blood to the extremities of the petal, there exposing it to the *light* and to the *air*, under a delicate membrane, which covers the internal surface of the petal, where it often changes its color, and is seen beautifully in party-colored tulips

and poppies. The vegetable blood is collected at the extremities of what Darwin calls the coral arteries, and is returned by correspondent veins, exactly as he describes it in the green foliage.

It is presumed, that this breathing and circulating structure has for its end the sustenance of the anthers and stigma, as well as for the elaboration of honey, wax and essential oil, and for perfecting the prolific powder. The poetical author of the Botanic Garden imagines, that as the glands which secrete the honey, and perfect the pollen, and prepare and exalt the odoriferous essential oil, are attached to the petals, and always fall off and perish with them, it is an evidence that the vegetable blood is elaborated and *oxygenated* in this pulmonary system of the flower, for the express purpose of these important secretions. We leave to the philosophic botanist to determine, whether there be more of hypothesis than demonstration in this assertion. We should, however, bear in mind this fact, that as the green leaves constitute the organs of respiration to the leaf-buds, so the *bractes* perform the same office to the flower-buds.

Assuredly there are few things in nature that delight the eye and regale the smell like what Milton calls "the bright, consummate *flower*." Some of them far exceed the finest feathers, the most brilliant shells, or the most precious stones, or costly diamonds. This appears to have been the judgment of the learned and tasteful in all ages. The term *flower* has been always used to express the most excellent and valuable part of a thing; it is synonymous with embellishment, or ornament; it is used to express the prime, acme, or perfection, of an individual in the animal kingdom, as well as the most distinguished and most valuable mental acquirement; as the flower of the family, the flower of the army, the flower of chivalry. To say that "he cropt the flowers of every virtue," is to express all that can be conceived of human perfection.

By the expressive term of *fructification*,* botanists mean, not only the evanescent flower, but the green or imperfect fruit, for they cannot well be separated; as a growing plant, like a living animal, remains not a moment the same, but is continually changing; hence fructification is defined by Linnæus to be a temporary part of plants, terminating the old vegetable, and beginning the new. The perfection of the vegetable consists in its fructification; the essence of the fructification consists in the flower and fruit; the essence of the flower consists in the antheræ and stigma; and the essence of the fruit consists

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* Fructification comprehends the *now* state of the flower, and the *futurition* of the fruit.

in the seed; and the essence of the seed consists in the corculum; which is fastened to the cotyledon; and the essence of the corculum consists in the plumula, in which is the *punctum vitæ* of the plant itself; very minute in its dimensions, but capable, by the combination of intrinsic caloric with its innate oxygen, of increasing like a bud, to infinity.

From this view of the produce of fructification, the disciples of Linnæus have learned the following principles:

1st. That every vegetable is furnished with flower and fruit; there being no species where these are wanting.

2d. That there is no fructification without anthera, stigma, and seed.

3d. That the anthera and stigma constitute a flower, whether the petals or corolla be present or not.

4th. That the seed constitutes a fruit, whether there be a pericarpium or not.

Linnæus's theory of fructification is this: he supposes that the medullary part of a plant, that is to say, the pith, must be joined with the external, or cortical part, for the purpose of producing a new one. If the medulla be so vigorous as to burst through its containing vessels, and thus mix with the cortical part, a bud is produced, either on the branches or the roots of vegetables: otherwise the medulla is extended till it terminates in the pistillum, or female part of the flower; and the cortical part is likewise elongated, till it terminates in the anthera, or male part of the flower; and then the fecundating dust, from the latter, being joined to the prolific juices of the former, produces the seeds, or new plants; at the same time the inner rind is extended into the petals or corolla, and the outer bark into the calyx. This view of a plant will illustrate our assertion, that the seven essential parts, discoverable in the section of a trunk of a tree, may be discerned in its blossom.

Plants, more especially "the bright, consummate flower, *spirits odorous breathe*." On what does this agreeable odor depend? The chemists say, on the oil; but this is not going far enough.

ESSENTIAL OILS OF PLANTS.

The bright, consummate FLOWER, say the most learned of poets, "*spirits odorous breathes*." Let us now enquire on what this odor depends. The chemist tells us, that it depends on the *oil* of the plant. But we are dissatisfied with this vague answer. A vegetable distils two kinds of oil, differing very much from each other; the one is *fixed*, and the other *volatile*. The fixed oil is combined with mucilage; the volatile, with the *aroma*, or *spiritus rector* of the plant. The *fixed* oil is found

only in the seeds; and is confined almost entirely to those which have two cotyledons, as in the flax-seed, almonds, and rape-seed. But the *volatile* oil is found in every part of a plant, except the cotyledons of the seeds, where it never occurs; and is distinguished pre-eminently in *Milton's* bright, consummate flower.

When we say that the fine fragrance of a flower depends on its *volatile* oil; or that its *aromatic* virtue is contained in it, and hence called its *essential* oil, we do not go quite far enough. We are so far from being admitted, says the profound Locke, into the secrets of nature, that we scarcely approach the first entrance. We overlook the operations of those invisible fluids, which encompass them, upon whose motions and operations depend those qualities, for which they are most remarkable. Thus this essential oil contains something more subtile and active than itself; a *spirit*, an exceedingly minute, volatile, and scarcely ponderable spirit, which, when separated, leaves nothing peculiar in the remaining oil. This is the *spiritus rector* of the old chemists, the predominant, prevailing, paramount, or *ruling* spirit of the plant. This aeriform fluidity, gas, or spirit, denominate it which you will, and which is inimitable by art, imparts that smell, taste, and medicinal virtue to that peculiar species of plants, and is found in no other. The *fixed* oil of a plant is innate; but the *essential* oil is the effect, or the result of the vegetable economy, operating in perfect health, and in full perfection, while drawing its sustentation from its native earth and air.

The essential oils of plants have their respective characteristics from their *aroma*, or spirits. The volatile oil serves, in some degree, for enveloping, arresting, and preventing a too sudden, and too copious expenditure of them; while the fixed oil serves only for connecting the solid parts together, like the oil or fat in animals. The difference in the nature of these two oils, is therefore very wide. How different must be the medicinal virtues of the root—the wood—the leaf—the flower—the fruit, and the seed of the same plant? Yet physicians have been in the habit of pounding up an entire vegetable in a mortar, and squeezing out the juices of it, and of giving this mixture of every thing to the sick; and from its operations we pronounce on its predominant medicinal virtue.

Those who filled our systems of *Materia Medica* with *Galenical* preparations, had no idea of the subtile structure and economy of a vegetable. While transforming a plant into an ointment, who ever thinks of its structure? And who that has attended closely to its structure and economy, can rely on its analysis by *fire*, which reduces every plant to the same *coal*, the same *earth*, and the same *salt*?

Some of our readers may be of the opinion, that by fixing our eyes too intently on the poetical flower of Milton, we have strayed from the enlightened path of modern chemistry, into such a thicket of odoriferous flowers, as to become, if not stupified, at least so far bewildered as not to be able to find our way out. We are aware that the term *spirit* is not fashionable. We mean by it, the finest and most subtile parts of bodies ; the most active part of matter, with regard to its facility of motion, in comparison with the grosser parts : we mean that which is discoverable by its smartness to the smell, and that which rises first in distillation. The name of spirit was formerly given to any subtile, volatile substance, that exhaled from bodies in a given degree of heat ; and, by a sort of imaginary analogy, was transferred to the human system ; hence the term *animal spirits*, which was ingeniously supposed to reside in the *nervous fluid*, as the *spiritus rector* resides in the essential oil of plants.

If the term *spirit* should displease the fastidious critic, we would remind him, that *spirit*, in the German language, is *gascht;* whence is derived the English word *ghost*, or *spirit;* and hence our fashionable word *gas*, or *gaz ;* by which we are to understand an excedingly rare, highly elastic, and invisible fluid, not condensible by cold. Should the critic persist in refusing his imprimatur to the term spirit, or *spiritus rector*, we will compound with him by giving him in its stead the word *quintessence ;* by which we mean the specific essence, the active principle, by the power of which medicines operate. By this term was meant the predominant, ruling, or distinguishing part of medicinal simples, which can be separated in imagination from the tangible body, leaving its organization entire. To be still more particular : the ancient philosophers, and after them our old chemists, conceived that *fire—air—water* and *earth*, contributed to the composition of all vegetables ; to all which was added a *fifth* thing, or *ens*, which enriched and distinguished the whole, by its own particular efficacy ; and on which the odor, taste, and virtue of each plant depended : they therefore asserted, that each species of plants was made up of the *four* common elements ; but to these was added a *fifth*, which, though small in quantity, was the most powerful, efficacious and predominant of its component parts ; this, therefore, they called the *fifth* essence—or, as expressed in Latin, the *quinta essentia.*

The knowledge of *quintessences* was considered two hundred years ago, as the utmost bounds, the *ne plus ultra* of chemical perfection. Is not this precisely the case, at present, with the knowledge of *gases*, or *spirits ?*

We have said, that all aromatic plants contain a volatile oil ;

but this aromatic oil does not reside in the same part in every kind of plant: sometimes indeed we find it distributed through the whole plant, as in the *Bohemian angelica:* sometimes it exists only in the bark, as in *cinnamon*. *Balm*, *mint*, *rosemary*, and *wormwood* contain their essential oil in their leaves and stems; while the *elecampane* and *florentine iris* deposite it in their roots. All the *terebinthenate*, or resin-bearing tree, have it in their young branches; while the *chamomile* and the *rose* have it in their petals. Many fruits contain it throughout their whole substance, as *pepper* and *juniper*. *Oranges* and *lemons* contain it in their rind or peel. The *nutmeg-tree* bears its essential oil in the nut, and its immediate envelopment, or rather its second envelopment, which is *mace*. The seeds of the *umbelliferous* plants, such as *fennel*, *cummin* and *anise* have the vesicles of essential oil along the projecting lines of their skins.

Passing from the *aroma* of plants to those qualities which powerfully affect the organs of *taste*, we remark that the taste of essential oils is pungent, or hot. But it is curious that the taste of the plant does not always influence that of its essential oil; for the oil of pepper has no extraordinary acrimony; and that which is obtained from *wormwood* is not bitter: and so of *color:* the oil of *red* roses is *white;* the oil of lavender *yellow;* and that of chamomile a fine *blue*. The oil of parsley is of a *bright green*, and that of millefoil a *sea green*. This is a valuable part of botany, and ought to be diligently pursued in this country,

TO OUR FAIR COUNTRY WOMEN.

If love be any refinement, conjugal love must be certainly so in a much higher degree. It is the parent of substantial virtues and agreeable qualities, and cultivates the mind while it improves the behavior.

Spectator, No. 525.

We dedicate the present chapter to such of our fair country women, as honor these essays with perusal. Our Flora, on this occasion, has bound her cheerful brow with *myrtle* and placed the *white rose* in her bosom.* We have moreover selected for a motto, a passage from that accomplished scholar and friend of the sex, Addison, as containing a charming sentiment, every way proper to precede the history of a female, who not only shone with uncommon splendor as an aritst and a botanist, but was rendered still more conspicuous by the additional lustre of conjugal affection, which virtue she exercised at the darkest periods, and during the most distressful pangs of human calamity.

* Plants sacred to love in ancient mythology.

Our fair readers will pardon us, if we should fail in celebrating conjugal affection, the ground work of all the domestic virtues. Teachers of righteousness themselves may excuse us, if we cast a look of regret to this too much neglected portion of moral philosophy. We have colleges for teaching every art and science. We have minute directions in gardening and agriculture. We have numberless books on the doctrine of business; on self policy, or the art of rising in life; on oratory, and on politics; while that which is worth them all, *the doctrine of domestic happiness*, is left comparatively uncultivated; yet this is that philosophy, spoken of by Lord BACON, which of all others "*comes home to men's business and bosoms.*"

The history of every civilized nation, nay every man's own recollection, affords abundant proofs, that the female mind is equally capable with that of the male. It is situation and circumstances that rouse the latent energies of the female soul. Whence is it that the children of widows become generally better men and better women, than children brought up in conjunction with the father? It is because afflictive circumstances have called forth the dormant energies of heroic woman, and perfected a virtue peculiar to the sex; a virtue which originated in conjugal affection. Can this evanescent world, this anxious scene, exhibit a more interesting sight to a philosopher, than a virtuous widow weeping over her "*houseless child of want?*" Yes; there is one picture still more affecting. It is where the father and husband is worse than dead, through his folly and his crimes. Here, if conjugal love has not been ripened into maternal affection, and grown up into the highest of stoical virtues, nay more, sublimed into religion, the wretched woman sinks into intemperance, or is lost in despair. An over anxious and unrestrained fondness is not true maternal affection. The fowls of the air and the beasts of the field have also a blind and furious fondness for their young. Maternal affection is where judgment draws more closely the bonds of nature.

The happiness of the conjugal state appears heightened, says Addison, to the highest degree it is capable of, when we see two persons of accomplished minds not only united in the same interests and affections, but in their taste of the same improvements, pleasures, and diversions. Pliny, one of the finest gentlemen and politest writers among the Romans, has left us, in his letter to Hispulla, his wife's aunt, one of the most agreeable family pieces of this kind ever seen. We refer our readers to the 525th number of the Spectator for the letter itself, and hasten to give an account of an ingenious and excellent woman, who enlivened the dungeon of her husband with flowers, and entwined his fetters with the *white rose* and the *myrtle.*

It is a singular fact, says Dr. Pulteney, that physic is indebted for the most complete set of figures of the medical plants to the genius and industry of a lady, exerted on an occasion that redounded highly to her praise. The name of

MRS. ELIZABETH BLACKWELL

is well known, both from her own merit and the fate of her unfortunate husband, who, condemned for crimes of state, suffered death on the scaffold in Sweden, in the year 1747.

We are informed she was the daughter of a merchant in the neighborhood of Aberdeen, of which city Dr. Alexander Blackwell, her husband, was a native, and where he received a university education, and was early distinguished for his knowledge. After having failed in his attempt to introduce himself in practice, first in Scotland and afterwards in London, he became corrector to a printing press, and soon after commenced printing himself. But being prosecuted by the trade, and at length involved in debt, was thrown into prison. To relieve these distresses Mrs. Blackwell having a genius for drawing and painting, exerted all her talents; and, understanding that an herbal of medicinal plants was greatly wanted, she exhibited to sir Hans Sloane, Dr. Mead, and other physicians, some specimens of her art in painting plants, who approved so highly of them, as to encourage her to prosecute a work by the profits of which she is said to have procured her husband's liberty, after a confinement of two years. Dr. Isaac Rand was at that time Demonstrator to the Company of Apothecaries, in the garden at Chelsea. By his advice she took up her residence opposite the Physic Garden, in order to facilitate her design by receiving the plants as fresh as possible. He not only promoted her work with the public, but, together with the celebrated Philip Miller, afforded her all possible direction and assistance in the execution of it. After she had completed the drawings, she engraved them on copper, and colored the prints with her own hands. During her abode at Chelsea, she was frequently visited by persons of quality, and many scientific people, who admired her performances, and patronized her undertaking.

On publishing the first volume, in 1737, she obtained a recommendation from Dr. Mead, Dr. Sherard, Dr. Rand, and others, to be prefixed to it. And being allowed to present, in person, a copy to the College of Physicians, that body made her a present, and gave her a public testimonial of their approbation; with leave to prefix it to her book. The second volume was finished in 1739, and the whole published under the following title: *A curious Herbal, containing* 500 *cuts of the most useful plants which are now used in the practice of physic, en-*

graved on folio copper plates, after drawings taken from the life. By Elizabeth Blackwell. To which is added, a short description of the Plants, and their common uses in Physic. 1739." 2 Vol. fol.

The drawings are in general faithful; and if there is wanting that accuracy which modern improvements have rendered necessary in delineating the more minute parts, yet, upon the whole, the figures are sufficiently distinctive of the subject. Each plate is accompanied with an engraved page, containing the Latin and English officinal names, followed by a short description of the plant, and a summary of its qualities and uses. After these, occur the name in various other languages. These illustrations were the share her husband took in the work. This ill-fated man, after his failure in physic, and in printing, became an unsuccessful candidate for the place of secretary to the Society for the encouragement of Learning. He was made superintendent of the works belonging to the Duke of Candos, at Cannons, and experienced those disappointments incident to projectors. He formed schemes in agriculture, and wrote a treatise on the subject, which we are told was the cause of his being engaged in Sweden. In that kingdom he drained marshes, practised physic, and was even employed in that capacity for the king. At length he was involved in some state cabals, or, as some accounts have it, in a plot with Count *Tessin*, for which he suffered death, protesting his innocence to the last.

So respectable a performance as Mrs. Blackwell's, attracted the attention of physicians on the continent. It was translated into German, and republished at Norimburg in 1750. To this edition was prefixed a most elaborate and learned catalogue of botanical authors. In 1773, a supplemental volume, exhibiting plants omitted by Mrs. Blackwell, was published under the direction of Ludwig, Rose and Boehmer. In this form, the work of this learned and ingenious lady surpassed all that had been published. We hope the patrons of botany will gratify the ladies of America with a sight of these splendid books, not merely as a valuable treasure of botanical knowledge, but to show the men to what a degree of perfection the other sex may ascend, when their talents are brought forth, and sublimed by conjugal affection.

Prior to the time of Mrs. Blackwell, flourished the very ingenious and indefatigable

MARIA SYBIL MERIAN,

Who was born in Francfort, in 1647. Her father was a celebrated engraver, and from him she acquired a knowledge of drawing. He placed her under the instruction of an eminent painter, from whom she learnt a remarkable neatness of man-

aging the pencil, and delicacy of coloring. She was particularly fond of painting subjects of natural history, such as plants, reptiles, and insects, which she most commonly drew from nature: at the same time she studied those objects with a curiosity and with the inquisitive spirit of a naturalist; so that her knowledge of nature and the work of her hands rendered her every day more and more celebrated. She most commonly painted her subjects on vellum, and in water colors, and she finished an astonishing number. She painted the caterpillar, in all its various changes and forms in which they successively appear, from their quiescent state till they become butterflies. Not contented with painting the plants, insects, and reptiles of her own country, this enterprising woman crossed the Atlantic and visited Surinam, to paint those plants, insects, and reptiles which were peculiar to that climate. At her return to Europe, she published two volumes of engravings, which she executed from her own paintings, and which hold a high rank in that art. But they are not equal to her paintings; for her glistening serpents, her wet frogs, and her crawling spiders, are executed with horrible precision. This celebrated woman died in 1717. She left a daughter, who painted in the same style, and who had accompanied her mother to Surinam. This young lady published a third volume in folio, collected from the designs of her mother, which complete work has been always admired by the learned, as well as by the professors of painting.

We cannot too strongly recommend to our fair readers the art of delineation or drawing. What a decided superiority does a facility in this art give to the person who possesses it, over the one who does not? If the time consumed by our young ladies, in learning to play tolerably ill on sundry musical instruments, were devoted to the charming art of copying nature, and acquiring some knowledge of her works, how beautifully would it embellish our system of female education? This art is not merely in itself amusing, but may be highly useful and important, in a change of fortune and under the pressure of adverse circumstances, as has been illustrated in the history of the amible but unfortunate Elizabeth Blackwell.

CLASSIFICATION OF PLANTS.

The indefatigable *John* and *Casper Bauhin* undertook an universal history of plants, with a synonymy, or exact list of the names that every plant bore in all the writers who preceded them. Their works, which are examples of vast knowledge and solid labors, are still the guide to all those who wish to consult ancient authors on botany. After their death, which happened between the years 1624 and 1630, scarcely any author wrote on medicine, but wrote more or less on botany.

Hyeronymus Bouc, a German, was the first of the moderns who has given a *methodical* distribution of vegetables. In his history of plants, published in 1532, he divides the eight hundred species there described into three classes, founded on their qualities, habit, figure and size. *Clusius* endeavored soon after to establish the natural distinction of Theophrastus, which was into trees, shrubs, and undershrubs. Others attempted to characterize plants by the roots, stems, and leaves, but all were found insufficient. It was thirty years from this time that *Gesner* suggested the first idea of a system founded on the *flower* and *fruit*. But the application of this suggestion was not made till twenty years afterwards by *Cæsaralpinus*, a physician and professor of botany at Padua. Yet this system of Cæsaralpinus, founded on scientific principles, perished, or rather slept for nearly a century, when it was awakened by Dr. *Morison* of Aberdeen. The next systematical arrangement of plants was given by the learned and pious Mr. *Ray*. His general history of plants contains eighteen thousand six hundred and fifty-five species and varieties. He allows one division to such plants as grow at the bottom of the sea; or upon rocks that are surrounded by that element; but naturalists have now removed these from the vegetable to the animal kingdom. Then *Herman* of Leyden published his systematic arrangement; and soon after the famous *Boerhaave* favored the public with his plan. About this time, or a little anterior, viz. the year 1700, the celebrated *Tournefort* came forth with his learned and extensive botanical system; then *Knaut*, *Ludwig*, *Pontedra* and *Magnolius*. It appears that Cæsaralpinus followed Gesner; Morison, Cæsaralpinus; Ray improved upon Morison; Knaut abridged Ray; Herman formed himself partly on Morison, and partly on Ray; while Boerhaave took the indefatigable Herman for his guide. But it was *Tournefort* of France who surpasssed all his predecessors in supplying a clue to the vegetable kingdom. Intricate as is this system, it was the most complete the world had ever seen. The French nation were proud of it; and gloried in giving an everlasting botanical system to an admiring world. Yet Tournefort did but clear the way for one still greater than himself; for in the year 1735 arose the sun of the botanical world, LINNÆUS; of whose system we can give here only a mere sketch or outline.

Excepting *Aristotle*, the ancient writers on Natural History had no systematical arrangement; but described plants and animals as they came to hand. The boundaries of natural history have been so enlarged by modern enterprise and industry, that it has become necessary to class and sort this vast multitude, or the student of nature would be lost in the exuberance before him. It is natural enough, says that pleasant writer, Gold-

smith, for ignorance to lie down in hopeless uncertainty; and to declare, that to particularize each body is utterly impossible; but it is otherwise with the active, searching mind: no way intimidated with the immense variety, it begins the task of numbering, grouping and classing all the various kinds that fall within its notice; finds every day new relations between the several parts of creation, acquires the art of considering several at a time under one point of view; and at last begins to find that the variety is neither so great, nor so inscrutable as was first imagined. It is a difficult task to find out a particular man in an immense crowd, or mob of people; but if this promiscuous jumble of people be systematized, or arranged into brigades, regiments, companies, and platoons, we shall be able to find the individual without much difficulty. It is thus in a systematical arrangement of vegetables. *Bonnet* has, in a great measure, disregarded system; and *Buffon* has treated it with contempt. But the eloquent author of the "*History of the Earth and Animated Nature*" justly remarks, that books are written with opposite views, some only to be read, and some only to be occasionally consulted; that the methodists have sacrificed to order alone all the delights of the subject, all the acts of heightening, awakening, or continuing curiosity. But he adds, that systematical arrangements "have the same use in science that a dictionary has in language; but with this difference, that in a dictionary we proceed from the name to the definition; in a system of natural history we proceed from the definition to find out the thing. Without the aid of system, Nature must still have lain undistinguished, like furniture in a lumber-room; every thing we wish for is there indeed, but we know not where to find it."

The opinion of Sir Joseph Banks had no small influence in diverting a celebrated Botanist from his project; for while under the influence of it, he had written to that celebrated Naturalist. He in answer says:—"How can you and I correspond about a plant, which you may have found in America, or I in Europe, and is known to but one of us, unless we have agreed on a technical language, by which we can describe to each other the constituent parts; and by that means agree to what known plant it bears the greatest resemblance. The Linnæan system is not certainly to be considered as free from faults. All human contrivance will abound with them. But still I cannot help allowing that, as far as I know, it is the best hitherto invented, by a great interval; and as such, is now, in a manner invariably received by the whole learned world."

We therefore present our readers with a sketch of this famous system.

THE OUTLINES OF LINNÆUS'S SYSTEM OF VEGETABLES.

The sexual system, as invented and given to the world by Linnæus, is built or founded on the *male* and *female* parts of FRUCTIFICATION. By fructification is meant *flower* and *fruit;* and is disposed according to the number, proportion and situation of the *stamens* or *pistils*, or the male and female organs.

For the sake of brevity of expression, he has had recourse to the Greek language. *Andria*, from Ανηρ, a husband, he has applied to the stamen; and *gynia* from γυνη, a wife, to the pistil. The STAMEN consists of two parts:—first, the *filament* is that part which elevates the anthera;—second, the *anthera* is the part that bears the pollen, or farina fæcundans, that impregnates the pistillum or germen.

First, The PISTULLUM consists of three parts; the *germen* or embryo of the future fruit;—second, the *style*, which elevates the stigma; third, the *stigma* or summit, which is covered with a moisture, that dissolves the farina fæcundans of the anthera, fitting it for vivification.

Of the CLASSES and ORDERS, with the names of plants exemplifying them.

MONANDRIA

CONTAINS II ORDERS.

One Stamen in the Hermaphrodite Flower.

Class I.	Order I.	*Monogynia*	E. G.	Canna.
	Order II.	*Digynia*		Blitum.

DIANDRIA

CONTAINS III ORDERS.

Two Stamens in the Hermaphrodite Flower.

Class II.	Order I	*Monogynia*	E. G.	Monarda.
	Order II.	*Digynia*		Anthoxanthum.
	Order III.	*Trigynia*		Piper.

TRIANDRIA

CONTAINS III ORDERS.

Three Stamens in the Hermaphrodite Flower.

Class III.	Order I.	*Monogynia*	E. G.	Crocus.
	Order II.	*Digynia*		Avenna.
	Order III.	*Trigynia*		Molluggo.

TETRANDRIA

CONTAINS III ORDERS.

Four Stamens in the Fower with the Fruit.

(If two proximate Stamens are shorter, let it be referred to Class XIV.)

Class IV.	Order I.	*Monogynia*	E. G.	Dipsacus,
	Order II.	*Digynia*		Hammamelis.
	Order III.	*Tetragynia*		Potamogeton.

PENTANDRIA

CONTAINS VI ORDERS.

Five Stamens in the Hermaphrodite Flower.

Class V.	Order I.	*Monogynia*	E. G.	Nerium.
	Order II.	*Digynia*		Anethum.
	Order III.	*Trigynia*		Turnera.
	Order IV.	*Tetragynia*		Parnassia.
	Order V.	*Pentagynia*		Crassula.
	Order VI.	*Polyginia*		Myosurus.

HEXANDRIA

CONTAINS V ORDERS.

Six Stamens in the Hermaphrodite Flower.

(If of this, two opposite Stamens are shorter, it belongs to Class XV.)

Class VI.	Order I.	*Monogynia*	E. G.	Amaryllis.
	Order II.	*Digynia*		Oryza.
	Order III.	*Trigynia*		Rumex.
	Order IV.	*Tetragynia*		Petiveria.
	Order V.	*Polyginia*		Alisma.

HEPTANDRIA

CONTAINS IV ORDERS.

Seven Stamens in the same Flower with the Pistillum.

Class VII.	Order I.	*Monogynia*	E. G.	Aesculus.
	Order II.	*Digynia,*		Limeum,
	Order III.	*Tetraginia*		Saururus.
	Order IV.	*Heptagynia*		Septas.

OCTANDRIA

CONTAINS IV ORDERS.

Eight Stamens in the same Flower with the Pistillum.

Class VIII.	Order I.	*Monogynia*	E. G.	Oenothera.
	Order II.	*Digynia*		Galenia.
	Order III.	*Trigynia*		Polygonum.
	Order IV.	*Tetragynia*		Adoxa.

ENNEANDRIA

CONTAINS III ORDERS.

Nine Stamens in the Hermaphrodite Fower.

Class IX.	Order I.	*Monogynia*	E. G.	Cassyta.
	Order II.	*Trigynia*		Rheum.
	Order III.	*Hexagynia*		Butomus.

DECANDRIA

CONTAINS V ORDERS.

Ten Stamens in the Hemaphrodite Flower.

Class X.	Order I.	*Monogynia*	E. G.	Kalmia.
	Order II.	*Digynia*		Saxifraga.
	Order III.	*Tryginia*		Stellaria.
	Order IV.	*Pentagynia*		Oxalis.
	Order V.	*Decagynia*		Phytolacca.

DODECANDRIA

CONTAINS V ORDERS.

Stamens, from twelve to nineteen in the Hermaphrodite Flower.

Class XI.	Order I.	*Monogynia*	E. G.	Asarum.
	Order II.	*Digynia*		Agrimonia.
	Order III.	*Trigynia*		Euphorbia.
	Order IV.	*Pentagynia*		Glinus.
	Order V.	*Dodecagynia*		Sempervium.

ICOSANDRIA

CONTAINS V ORDERS.

The Stamens inserted (not in the Receptacle, but) in the inside of the Calyx.— Commonly twenty, often more.

Class XII.	Order I.	*Monogynia*	E. G.	Punica.
	Order II.	*Digynia*		Cratægus.
	Order III.	*Trigynia*		Sorbus.
	Order IV.	*Pentagynia*		Pyrus.
	Order V.	*Polyginia*		Rubus.

POLYANDRIA

CONTAINS VII ORDERS.

The Stamens inserted in the Receptacle from twenty to an hundred, in the same with the Pistil in the Flower.

Class XIII.	Order I.	*Monogynia*	E. G.	Sarracenia.
	Order II.	*Digynia*		Fothergilla.
	Order III.	*Trigynia*		Aconitum.
	Order IV.	*Tetragynia*		Tatracera.
	Order V.	*Pentagynia*		Aquilegia.
	Order VI.	*Hexagynia*		Stratiotes.
	Order VII.	*Polygnia*		Ranunculus.

DIDYNAMIA

CONTAINS II ORDERS.

Four Stamens, of which two are close together, and are longer.

Class XIV.	Order I.	*Gymnospermia*	E. G.	Melittis.
	Order II.	*Agiospermia*		Melianthus.

TETRADYNAMIA

CONTAINS II ORDERS.

Six Stamens; four of which are long, the two opposite short.

Class XV.	Order I.	*Siliculosa*	E. G.	Lunaria.
	Order II.	*Siliquosa*		Cheiranthus.

MONADELPHIA

CONTAINS V ORDERS.

The Filaments of the Stamens grown together into one Body

Class XVI.	Order I.	*Pentandria*	E. G.	Hermannia.
	Order II.	*Enneandria*		Dryandra.
	Order III.	*Decandria*		Geranium.
	Order IV.	*Dodecandria*		Pentapetes.
	Order V.	*Polyandria*		Alcea.

DIADELPHIA

CONTAINS IV ORDERS.

The Filaments of the Stamens grown together into two Bodies.

Class XVII.	Order I.	*Pentandria*	E. G.	Monnieria.
	Order II.	*Hexandria*		Fumaria.
	Order III.	*Octandria*		Polygala.
	Order IV.	*Decandria*		Lathyrus.

POLYDELPHIA

CONTAINS III ORDERS.

The Filaments of the Stamens grow together imto three or more Bodies.

Class XVIII.	Order I.	*Pentandria*	E. G.	Theobroma.
	Order II.	*Icosandria*		Citrus.
	Order III.	*Polyandria*		Hypericum.

SYNGENESIA

CONTAINS VI ORDERS.

The Stamens with the Antheras grown together in the form of a cylinder (having rarely Filaments.)

Class XIX.	Order I.	*Polygamia Æqualis*	E. G.	Leontodon.
	Order II.	*Polygamia Superflua*		Xeranthemum.
	Order III.	*Polygamia Frustranea*		Helianthus.
	Order IV.	*Polygamia Necessaria*		Calendula.
	Order V.	*Polygamia Segregata*		Echinops.
	Order VI.	*Monogamia.*		Lobelia.

GYNANDRIA

CONTAINS VIII ORDERS

The Stamens inserted on the Pistil (not on the Receptacle.)

Class XX.	Order I.	*Diandria*	E. G.	Orchis.
	Order II.	*Triandria*		Sisyrinchium.
	Order III.	*Tetrandria*		Nepenthes.
	Order IV.	*Pentandria*		Passiflora.
	Order V.	*Hexandria*		Aristolochia.
	Order VI.	*Decandria*		Helicteres.
	Order VII.	*Dodecandria*		Cytinus.
	Order VIII.	*Polyandria*		Arum.

MONOECIA

CONTAINS XI ORDERS.

The Male and Female Flowers on the same Plant.

Class XXI.	Order I.	*Monandria*	E. G.	Zanichellia.
	Order II.	*Diandria*		Lemna.
	Order III.	*Triandria*		Tripsacum.
	Order IV.	*Tetrandria*		Urtica.
	Order V.	*Pentrandria*		Parthenium.
	Order VI.	*Hexandria*		Pharus.
	Order VII.	*Heptandria*		Guettarda.
	Order VIII	*Polyandria*		Juglans.
	Order IX.	*Monadelphia*		Pinus.
	Order X.	*Syngenesia*		Momordica.
	Order XI.	*Gynandria*		Andrachne.

DIOECIA

CONTAINS XIV ORDERS.

The Male Flowers on a different Plant from the Female.

Class XXII.	Order I.	*Monandria*	E. G.	Pandanus.
	Order II.	*Diandria*		Salix.
	Order III.	*Triandria*		Empetrum.
	Order IV.	*Tetrandria*		Viscum.
	Order V.	*Pentandria*		Humulus.
	Order VI.	*Hexandria*		Tamus.
	Order VII.	*Octandria*		Populus.
	Order VIII.	*Enneandria*		Mercurialis.
	Order IX.	*Decandria*		Kiggelaria.
	Order X.	*Dodecandria*		Menispermum.
	Order XI.	*Polyandria*		Cliffortia.
	Order XII.	*Monadelphia*		Juniperus.
	Order XIII.	*Syngenesia*		Ruscus.
	Order XIV.	*Gynandria*		Clutia.

POLYGAMIA

CONTAINS III ORDERS.

Hermaphrodite and Male or Female Flowers on the same Plant.

Class XXIII.	Order I.	*Monoecia*	E. G.	Veratrum.
	Order II.	*Dioecia*		Fraxinus.
	Order III.	*Trioecia*		Ficus.

CRYPTOGAMIA

CONTAINS IV ORDERS.

The Flowers within the Fruit; or in so singular a mode as not to be perceptible to the eye.

Class XXIV.	Order I.	*Filices*	E. G.	Polypodium.
	Order II.	*Musci*		Bryum.
	Order III.	*Algæ*		Fucus.
	Order IV.	*Fungi*		Agaricus.

PALMÆ.

Class XXV. *Palms:* the flowers borne on a *spadix,* and within a *spathe.* E. G. Cocos.

The ORDERS are taken from the FEMALES, or PISTILS, as the classes are from the MALES, or STAMENS; but in the classes of the Syngenesia the orders differ from the rest.

POLYGAMIA ÆQUALIS.

That is, Of many Fosculi furnished with stamens and pistils. Flowers of this sort are for the most part commonly called *flosculous.*

POLYGAMIA SPURIA.

That is, Where hermaphrodite flosculi occupy the disk, and that female flosculi surround the margin, which are deprived of stamina, and that in a three-fold manner.

SUPERFLUOUS.

That is, That when the flowers of the hermaphrodite disk are furnished with a stigma, and produce seeds, the female flowers also, that constitute the radius, produce seeds in like manner.

FRUSTRANEOUS.

That is, When the flowers of the hermaphrodite disk are furnished with a stigma, and produce seeds; but the flosculi constituting the radius, being deprived of a stigma, cannot produce seeds.

NECESSARY.

That is, When the hermaphrodite flowers, through a defect of the stigma or pistil, cannot perfect their seeds; but female flowers in the radius produce perfect seeds.

SEGREGATED.

That is, When several floriferous calyxes are contained in a calyx common to all, so as to form only one flower.

The young student of botany will understand the preceding sketch of the Linnæan System, if he have recourse to the *Letters on the Elements of Botany, addressed to a Lady*, by the celebrated J. J. Rousseau, translated by Dr. Martin. If to this pleasant guide, he should add John Miller's engraved illustrations of the sexual system of Linnæus, he will be soon able to proceed without the help of books, as it regards the system. It is superfluous to add a word to what has been said respecting the botanical writings of Linnæus. But "botany is not to be learnt in the closet: you must go into the garden or the fields, and there become familiar with Nature herself; with that beauty, order, regularity, and inexhaustible variety, which is to be found in the structure of vegetables; and that wonderful fitness to its end, which we perceive in every work of creation.

LINNÆUS.

The figure which this learned physician, and illustrious naturalist made while living, and the great reputation of his works now he is dead, will justify us in devoting some space to his honor.

Charles Von Linne, or as the learned throughout the world have Latinized it, Carolus Linnæus, was born at Smaland in Sweden, in the year 1707. It has almost always happened that those who have occupied some of the highest seats in the temple of fame, have been obliged to climb up to it through the rough, dirty and difficult road of poverty, calumny and opposition. It was remarkably so with Linnæus, who was the son of an obscure clergyman, of an inconsiderable village in a gloomy

region of the globe. His father's income was so small, and his family so large and straightened in their circumstances, that this prince of naturalists was on the point of being bound to a mechanic. The design of binding Linnæus to a shoe-maker was over-ruled by his uncle, and he was sent to school when he was ten years of age. At this early period, his chief amusement was gathering plants and hunting after insects.

Almost all young men, when just stepping on the stage of busy life, press forward to the acquisition of riches, as the surest road to power and reputation; whilst a few, a very few, consider wealth as a secondary object, and pursue with ardor fame or reputation as the first. Hence there have not been many very famous literary characters who have not commenced their career in poverty; and most of them have found that "*Slow rises worth by poverty depress'd.*"

In the year 1728, he removed to Upsal, where he obtained the patronage of several eminent men, particularly of OLAUS CELSIUS, at that time Professor of Divinity, and the restorer of natural history in Sweden. Under such encouragement he made rapid progress in his studies, and in the esteem of the Professors. We have this striking proof of his merits and attainments, that after only two years residence, he was thought sufficiently qualified to give lectures, occasionally, from the botanic chair, in the room of Professor Rudbeck.

In 1731 the Royal Academy of Sciences, having a desire to improve the natural history of Sweden, deputed Linnæus to make the tour of Lapland, with the sole view of exploring the natural history of the arctic region, to which his reputation, as a scholar and a naturalist, and his tough constitution, equally recommended him. He traversed the Lapland desert, which was destitute of villages, roads, cultivation, or any conveniences. He spent about five months in this tour, suffering innumerable hardships and privations; and that too for a very small stipend, scarcely enough to buy him shoes, which must have been an important article of clothing; for poor Linnæus traveled ten degrees of latitude on foot. Several years after he traveled through Holland, Brabant, and France, in the same manner, gathering plants on the way, and searching for minerals.

In 1733 this indefatigable naturalist was sent by the government to visit the mines in Sweden. On his return to Upsal, he gave lectures on mineralogy in the university. In 1735, when he took his degree of Doctor of Physic, he published the first sketch of his SYSTEMA NATURÆ, in a very compendious way, and in the form of tables, in twelve pages only. By this it appears, that he had at a very early period, before he was twenty-four years of age, laid the basis of that magnificent work, which he afterwards raised, and which will ever remain a lasting mon-

ument of his genius and industry. In the same year he retired to *Fahlum*, a town in Dalecarlia, where he gave lectures on mineralogy and the docimastic art; and where he practised physic. In 1736 he passed over into England, carrying letters of recommendation from the famous BOERHAAVE, who was at that time Professor of the Theory and Practice of Physic at Leyden, the glory of the medical world, and one of the best botanists of the age. That the sagacious Boerhaave penetrated the true character of Linnæus, and predicted his future fame and greatness, appears by his letter of introduction to Sir Hans Sloane. Although Boerhaave particularly recommended him to Sir Hans Sloane, President of the Royal Society, Sir Hans paid him but little attention; for Linnæus was not one of those gay young men that attract much personal attention. He was negligent of dress and diminutive of stature. The patronage of so illustrious a man rendered Linnæus still more conspicuous; Boerhaave himself being a cultivator of natural history and botany, the merits of Linnæus could hardly escape his perspicacity.

Boerhaave's friendship for Linnæus continued to the latest period of his existence. When Linnæus visited him in his last sickness, and but a short time before this light of the medical world was extinguished, Boerhaave taking an affectionate leave of his young friend, said, "I have lived my time out, and my days are at an end. I have done every thing that was in my power. May God protect thee, with whom this duty remains! What the world required of me, it has got; but from thee, my dear Linnæus, it expects much more!"

In 1737 Linnæus published the *Genera Plantarum*, which completely unfolded the sexual system, as far as related to classical and generical characters; and in the same year exemplified it in the species by the *Flora Lapponica*, and the *Hortus Cliffortianus*. At the same time, he dedicated to DILLENIUS, the *Critica Botanica*, in which he explains his reasons for the change of names, and for the establishment of new distinctions, both of which, he well knew, would be considered as dangerous innovations.

In 1738 Linnæus really imagined, that he had fixed down for the last time in the practice at Stockholm; for being now married, he concluded it was time to settle down for life, and give over gathering plants in the arctic circle, and searching the bowels of the earth for minerals. He however met with great opposition in his business. He was too learned and too eminent not to excite all that envy and jealousy could engender and inflict. At Stockholm his enemies oppressed him with many difficulties; but the abilities and persevering spirit of Linnæus surmounted them all, so that he came at length into

extensive practice as a physician. But his vast and ardent mind would not allow him to confine it to such drudgery; especially when the fruit of his labor was to be only money. *Count Tessen* was his patron, through whose influence medals were struck in his honor. He enjoyed also a stipend from the citizens of Stockholm for giving lectures in botany.

In 1741 Linnæus was appointed joint Professor of Physic with *Rosen*. These two colleagues agreed to divide the medical department between them. Professor Rosen took *anatomy*, *physiology*, *pathology*, and *therapeutics*; whilst Professor Linnæus toook *natural history*, *botany*. *materia medica*, *dietetics*, and the *diagnosis morborum*. The systematic genius of this prince of naturalists displayed itself in his mode of teaching medicine; for he arranged in the form of a table all the diseases that afflict mankind. Sauvage in France followed his plan, and made many improvements; and the late Dr. Cullen carried it to a high degree of perfection. According to this plan, diseases are arranged, in imitation of botanists, into *classes*, *orders*, *genera*, and *species*. This mode of arranging disorders is called *Nosology*, The reputation of the Swedish University at Upsal rose to a height before unknown, during the time when its medical department was under the direction of Linnæus. But that, which has established forever the name of Linnæus; and which has reflected honor on his country, is the SYSTEMA NATURÆ. Nothing since the labors of Aristotle can be compared to it for depth of knowledge and extent of research.

From this period the reputation of Linnæus bore some proportion to his merit; and extended itself to distant countries; insomuch that there was scarcely a learned society in Europe but was eager to elect him a member; scarcely a crowned head but sought some means to honor him. His emolument kept pace with his fame and honors. It was no longer *laudatur et alget*.* His practice as a physician became lucrative: and we find him possessed of his country house and gardens in the vicinity of the capital. Linnæus received one of the most flattering testimonies of the extent and magnitude of his fame, that perhaps was ever shown to any literary character, the state of the nation that conferred it, with all its circumstances, duly considered. This was an invitation to Madrid from the king of Spain, there to preside as a naturalist, with the offer of an annual pension of 2,000 pistoles, letters of nobility, and the perfect free exercise of his religion. But, after the most perfect acknowledgements of the singular honor done him, he returned for answer, "*that if he had any merits, they were due to his own country.*"

* Starving on universal praise; or living in splendid wretchedness.

This extraordinary man died January 11th, 1778, in the 71st year of his life, leaving a glorious reputation. Uncommon respect was shown to his memory. At the commemoration of his death, by the Royal Academy of Sciences, the king of Sweden honored the assembly with his presence; nay farther, in his speech from the throne to the Swedish parliament, that philosophic monarch lamented the death of Linnæus as a public calamity. He said, "I have lost a man whose fame was as great all over the world, as the honor was bright, which his country derived from him as a citizen. Long will Upsal remember the celebrity which it acquired by the name of Linnæus!"

Linnæus had a good constitution, though often grievously afflicted with the headache, and in the latter part of his life with the gout. This great man was of a diminutive stature, his head large, and its hinder part very high. His look was ardent, piercing, and apt to daunt the beholder; and his temper quick; nevertheless his conduct towards his numerous opponents shews a dignified spirit of forbearance. He disavowed controversy, and seldom replied to the numerous attacks on his doctrine. He however, when attacked by *Siegesbeck*, and some other virulent calumniators, wrote a reply, entitled *Orbis eruditi judicium de Caroli Linnæi scriptis;* and with it gave a memoranda of his life. This Siegesbeck was a brother professor. He laid it down as a firm maxim, that every system must finally rest on its intrinsic merit; and he willingly committed his own to the judgment of posterity.

Diminutive as was the stature of Linnæus, his mind was of gigantic size. He was possessed of a lively imagination, corrected by a strong judgment, and guided by the laws of system; added to these, a most retentive memory, an unremitting industry, and the greatest perseverance in all his pursuits; as is evident from that continued vigor with which he prosecuted the design, that he appears to have formed so early in life, of *totally reforming and fabricating anew the whole science of natural history;* and this he actually performed, and gave to it a degree of perfection before unknown. He had moreover the the uncommon felicity of living to see his own structure raised above all others, notwithstanding every discouragement its author at first labored under, and the opposition it afterwards met with. Neither has any writer more cautiously avoided that common error of building his own fame on the ruin of another man's. He every were acknowledges the several merits of each author's system; and no man appears to be more sensible of the partial defect of his own.

Linnæus was of a noble mind; and his mind was made better by struggling with adversity. To be poor, and to be at the same time struggling on with some new discovery, or precious

improvement, is, in the strict sense of the word, to be in adversity; for one thus circumstanced never fails to have a numerous host against him, chiefly composed of the jealous, the envious, and the knavish. But has adversity no consolations? Is it not the best course of discipline a wise man can endure? He who has never been acquainted with adversity, says Seneca, is ignorant of half the scenes of nature; for prosperity very much obstructs the knowledge of ourselves. And he who was greater than Seneca, I mean Johnson, observes, that, that fortitude, which has to encounter no danger; that prudence, which has surmounted no difficulties; that integrity, which has been attacked by no temptations, can at best, be considered as gold not yet brought to the test; of which therefore the true value cannot be assigned.

When Linnæus first published his sexual system of botany, he experienced the same treatment which generally falls to the lot of those who have enlightened the world by the rays of their genius and learning: a few admired and extolled him; others ridiculed him, while some laboured to prove that he was destitute of common sense; and that he wrote about that which he did not himself understand. That those rivals who dwelt in the same city should view him with an "*evil eye*," that is, an eye made *sore*, by reason of his extraordinary light, which gave it pain, and which they therefore sought to veil, or put out, is not to be wondered at: but that it should give pain to the eye of count Buffon, and other celebrated men in France, is indeed pitiful. In England, and in some other parts of Europe, they received the new doctrine with all that caution which became an enlightened age and people; and Nature was traced experimentally through all her operations in the vegetable economy before the sexual doctrine of Linnæus was acknowledged. It is now firmly established as any law in nature.

Linnæus not only silenced all gainsayers; but had the uncommon good fortune of living to see the fruits of his own great exertions. He lived to see Natural History raise herself in his own native country under his culture, and the fostering hand of the government to a state of perfection unknown elsewhere. He lived to see it diffused thence all over the civilized world. He lived to see the sovereigns of Europe establishing societies for cultivating that science to which he had so long devoted his head and heart. And when he ceased to live, the philosopher saw with grateful admiration the sovereign of Sweden pronouncing the eulogy of Linnæus from his throne, and lamenting his death as a public calamity.

Linnæus was well acquainted with the art of recommending science by eloquence of language, and embellishing philosophy with polite literature. No man of the age had a

more happy command of the Latin tongue than Linnæus; and no man ever applied it more successfully to his purpose, or gave to description such copiousness, precision, and elegance. The glaring paint of Buffon suffers in comparison with the pleasing but solid manner of Linnæus; for this prince of naturalists possessed the sound, distinct, and comprehensive knowledge of Bacon, with all the beautiful light graces and embellishments of Addison. He knew, that those authors who would find many readers, and those lecturers who would secure attentive hearers, must please, whilst they instruct.

Physiology owes much to Linnæus. But *Pathology*, the foundation of the whole medical art, and of all medical theory, has been more improved by Linnæus in his *Clavis Medicinæ*, of eight pages only, which is a master piece in its way, and one of the greatest treasures in medicine, than by a hundred authors and books in folio.

The *Materia Medica* was in a confused state, and many articles were imperfectly known, until Linnæus reformed it. He was the first who said that all our principal medicines are *poisons;* and that physicians ought not to condemn poisons, but to use them, as surgeons do their knives, cautiously.

Besides medals there are several monuments erected to the honor of this great naturalist in the gardens of his admirers in different places in Europe. In 1778, Dr. Hope laid the foundation stone of a monument, since finished, in the botanic garden at Edinburgh, to the memory of Linnæus.

CONRAD GESNER.

The state of botanical method was quite unsettled when Conrad Gesner of Switzerland turned his eye to the *flower* and *fruit;* and suggested the *first idea* of a systematic arrangement. It was in 1506 that Gesner proposed to the world his idea of an arrangement from the parts of the flower and fruit. No plan however was established by Gesner upon this principle; he merely suggested the idea; but the application of it was made, twenty years after, by *Cæsaralpinus*, a physician and professor of botany at Padua, who thus favored the world with the *first system* of botany; which occurrence marks the second grand era in the history of this science.

It might have been expected, that a method, founded like that of Cæsaralpinus upon genuine scientific principles, would have been immediately adopted by the learned, and in establishing itself, have totally extirpated those insufficient characters, which during so many ages have disgraced the science. The fact however is, that this system of Cæsaralpinus perished almost as soon as it had existence; for with this learned physician died his plan of arrangement; and it was not till nearly a

century after, that *Dr. Robert Morison* of Aberdeen, attaching himself to the principles of Gesner and Cæsaralpinus, re-established their scientific arrangement upon a solid foundation; and from being only the restorer of a system, has been generally celebrated as its founder.

Imperfect as is the mode of distribution by Morison, it has furnished many useful hints to *Ray*, *Tournefort* and *Linnæus*, those great luminaries of the science, who were not ashamed to acknowledge the obligation.

Ray proposed his method to the world in 1682. It originally consisted of twenty-five classes, two of which respect trees and shrubs, and the remaining twenty-three herbaceous plants. The distinction into herbs and trees, which Ray's method sets out, acknowledges a different, though not more certain principle, than that of Cæsaralpinus and Morison. The former, in making this distinction, had an eye with the ancients, to the duration of the stem, the latter to its consistence. Ray has called in the buds as an auxiliary, and denominates trees, all such plants as bear buds; herbs, such as bear no buds. The objection, which lies against Linnæus's distinction into shrubs and trees, from the same principle, may be still more powerfully urged in the present case; for though all herbaceous plants rise without buds, all trees are not furnished with them; many of the largest trees in warm climates, and some shrubby plants in every country, being totally devoid of that scaly appearance, which constitutes the essence of a bud.

Ray allots one division to submarine plants, or such as grow at the bottom of the sea, or upon rocks that are surrounded by that element. They are either of a hard stony nature, as the plants termed *lithophyta*, of a substance resembling horn, as the *corallines*, or of a softer herbaceous texture, as the *fuci*, *spunges*, and *sea mosses*. It is curious, that the *corallines* have successively passed through each of the three kingdoms of nature. Some have classed them with the *mineral* kingdom; the greater part have arranged them with *vegetables*; but naturalists have now demonstrated, that they belong to the *animal* kingdom. The animality of this singular tribe of natural bodies was hinted at by *Imperati*, an Italian, in the year 1599, and afterwards by *Peyssonel*, in 1727; but it is to M. *Bernard Jussieu*, a French academician, and Mr. *Ellis*, of London, that we owe decisive facts, and a regular detail, demonstrating that corallines are ramified animals. Mr. Ellis has, in his natural history of corallines, parcelled them out into their several genera, by means of fixed and invariable characters, obvious in their appearance.

Ray's general history of plants contains *eighteen thousand*

six hundred and fifty-five species and varieties. His method was followed by Sir *Hans Sloane*, in his natural history of Jamaica; by *Petiver*, in his British herbal; by *Dillenius*, in his synopsis of British plants; and by *Martyn*, in his catalogue of plants that grow in the neighborhood of Cambridge, in England.

Dr. *Herman*, professor of botany at Leyden, was the first who introduced into Holland a genuine systematic arrangement of plants from the parts of fructification. Morison's method had been left incomplete; and Ray's, though perfect from its first appearance, did not all at once attract the attention of the learned; and was indeed for many years studied chiefly in England, the native country of its author. Ray labored under some disadvantages; he was not a physician, but a divine. The defects of Ray's original method, and its *impracticability*, did not elude the observations of Dr. Herman. He had applied himself with unremitting ardor, from his earliest years, to the study of plants; had examined with attention every plan of arrangement, and actually undertaken a long and perilous expedition into India, with the sole view of promoting his favorite science. Herman exhibited such marks of unwearied diligence, that he alone, it is said, reared twice as many plants in the garden at Leyden as had been introduced by all his predecessors put together, in the long space of an hundred and fifty years. Such a man merited the applause of the public, and attained it.

Dr. Herman's method consists of twenty-five classes, which are founded upon the size and duration of plants; the presence or absence of the petals and calyx; the number of capsules, cells and naked seeds; the substance of the leaves and fruit; the form and consistence of the roots; the situation and disposition of the flowers, leaves and calyx, and figure of the fruit. The method proposed by Herman excels all which preceded it, in the uniformity of its classical characters.

The famous *Boerhaave*, the glory of the medical art, was appointed professor of botany at Leyden in 1709. His method was a mixture of Ray's, Herman's and Tournefort's. The submarine and imperfect plants, which find no place in the system of Herman, are borrowed by Boerhaave from Ray. Boerhaave's classes are thirty-four in number, and subdivide themselves into an hundred and four sections, which have for their characters the figure of the leaves, stem, calyx, petals and seeds; the number of petals, seeds and capsules; the substance of the leaves; the situation of the flowers, and their difference in point of sex. By this method, Boerhaave arranged six thousand plants, the produce of the botanical garden at Leyden, which he carefully superintended for the space of twenty years, and

left to his successor, Mr. Adrien Royen, in a much more flourishing state than he had himself received it.

Botanical writers were disposed to walk in the track of their predecessors. Few had sufficient courage to venture upon an unbeaten path. Morison followed Cæsaralpinus; Ray improved upon Morison; Knaut abridged Ray; and Boerhaave makes Herman his guide. *Rivinus*, a professor of physic and botany at Leipsic, was the first who, in 1690, relinquishing the pursuit of affinities, and convinced of the insufficiency of the fruit, set about a method, which would atone by its facility for the want of numerous relations and natural families. A method purely *artificial* appeared to Rivinus the best adapted for the purpose of vegetable arrangement. It rests upon the number and equality of the petals; a system no less admired for its simplicity, than for the regularity and uniformity of its plan.

TOURNEFORT.

The celebrity of Tournefort requires that we should dwell a little on his history and character.

Joseph Pitton de Tournefort was born at Aix, in Provence, in 1656. He was educated in the Jesuits' college in Aix, and, like the great Boerhaave, intended for a divine; but, like that great man, quitted divinity for physic. In early life, he was nearly as fond of anatomy and chemistry as of botany. In 1679 he went to Montpelier, where he perfected himself in anatomy and physic. The botanic garden, established in that city by Henry IV. rich as it was, could not satisfy his unbounded curiosity. He ransacked all the tracts of ground within more than ten leagues of Montpelier. Then he explored the Pyrenean mountains and the Alps, and afterwards examined the vegetables in Provence, Languedoc, Dauphine and Catalonia. He travelled through Spain and Portugal. He took his degree of doctor in physic in 1698, when he published his *History of the Plants which grow about Paris, together with an account of their use in Medicine.*

In the year 1700, Dr. Tournefort received an order from the king to travel into Greece, Asia and Africa, not only to discover plants, but to make observations on natural history in general; upon ancient and modern geography; and even upon the customs, religion, and commerce of the people. From this grand tour he brought home *one thousand three hundred and sixty-six* NEW species of plants, most of which ranged themselves under one or other of the six hundred and seventy-three genera he had already established; and for all the rest he had but twenty-five genera to create, without being obliged to augment the number of classes; a circumstance which sufficiently proves the advantage of a system to which so many foreign and

unexpected plants were easily reducible. When Tournefort returned to Paris, he thought of resuming the practice of physic, which he had sacrificed to his botanical expedition; but experience shows us, says his biographer, that in every thing depending on the taste of the public, especially affairs of this nature, delays are dangerous. Dr. Tournefort found it difficult to resume his practice. He was at the same time professor of physic; the functions of the academy employed some of his time; the arrangement of his memoirs still more of it. This multiplicity of business affected his health; and when in this uncomfortable state, he accidentally received a blow on his breast, which in a few months put an end to his active, useful, and honorable life, which happened in December, 1708.

Tournefort surpassed all his predecessors in supplying a clue to the immense labyrinth which the vegetable kingdom exhibited to the astonished botanist. He gave the first complete regular arrangement, and cleared the way for one still greater than himself. For in 1735 rose the sun of the botannical world, *Linnæus.*

MARK CATESBY

Was (says Dr. Pulteney,) one of those men whom a passion for natural history very early allured from the interesting pursuits of life; and it led him at length to cross the Atlantic, that he might read the volume of nature in a country but imperfectly explored, and where her beauties were displayed in a more extended and magnificent scale than the narrow bounds of his native country exhibited. It is but too true, that the world at large will forever treat with ridicule and disdain, that man, who, thus deserting the paths that lead to riches, to preferment, or to honor, gives himself up to what are commonly deemed unimportant and trifling occupations. Few will give him credit for that secret satisfaction, for that inexhaustible pleasure, which the investigation of nature, in all her objects, incessantly holds forth to his mind; or believe that such employment can possibly compensate for the solid treasures of gain.

Mark Catesby was born about the latter end of 1679, or the beginning of the next year. He acquaints us himself, that he had very early a propensity to the study of nature, and that his wish for higher gratifications in this way first led him to London, which he emphatically styles "the centre of science," and afterwards impelled him to seek further sources in distant parts of the globe. The residence of some relations in Virginia favored his design; and he went to that country in 1712, where he staid seven years, admiring and collecting the various productions of the country, without having laid any direct plan for

the work he afterwards accomplished. During this residence, he conveyed seeds and specimens of plants, both dried and in a growing state, to Mr. Dale, of Braintree in Essex: and some of his observations on the country being communicated by this means to Dr. William Sherard, procured him the friendship and patronage of that gentleman.

On his return to England, 1719, he was encouraged by the assistance of several of the nobility, of Sir Hans Sloan, Dr. Sherard, and other naturalists, whose names he has recorded, to return to America, with the professed design of describing, delineating, and painting the more curious objects of nature. Carolina was fixed on as the place of his residence, where he arrived in May, 1722. He first examined the lower part of the country, making excursions from Charleston: and afterwards sojourned for some time among the Indians, in the mountainous regions at and about Fort Moore. He then extended his researches through Georgia and Florida: and having spent nearly three years on the continent, he visited the Bahama islands, taking his residence in the isle of Providence, carrying on his plan, and particularly making collections of fishes and submarine productions.

On his return to England, in the year 1726, his labors met with the approbation of his patrons. Catesby made himself master of the art of etching: and, retiring to Hoxton, employed himself in carrying on his great work, which he published in numbers of twenty plants each. The first appeared in the latter end of the year 1730: and the first volume, consisting of one hundred plates, was finished in 1732: the second in 1743; and the appendix, of twenty plates, in the year 1748.

A regular account of each number, written by Dr. Cromwell Mortimer, secretary of the Royal Society, was laid before the society as it appeared, and printed in the *Philosophical Transactions*, in which the Doctor has sometimes interspersed illustrative observations.

The whole work bears the following title "The Natural History of *Carolina*, *Florida*, and the *Bahama* Islands: containing the figures of birds, beasts, fishes, serpents, insects, and plants: particularly the forest trees, shrubs, and plants, not hitherto described, or very incorrectly figured by authors; together with their descriptions, in French and English. To which are added observations on the air, soil, and waters: with remarks upon agriculture, grain, pulse, roots. To the whole is prefixed a new and correct map of the countries treated of." By MARK CATESBY, F. R. S.

The number of subjects described and figured in this work stands as below:

Plants. - - -	171
Quadrupeds, - - -	9
Birds, - - - -	111
Amphibia, - - -	33
Fishes, - - -	46
Insects, - - -	31

In this splendid performance, the curious are gratified with the figures of many of the most beautiful trees, shrubs and herbaceous plants, that adorn the gardens of the present time. Many also of the most useful in the arts, and conveniencies of life, and several of those used in medicine, are here for the first time exhibited in the true proportion and natural colors. It is only to be regretted, that in this work a separate exhibition of the flower in all its parts should be wanting; in the defect of which, several curious articles have not been ascertained. It is a requisite of modern date, and without it every figure, especially of a new species, must be deemed imperfect.

Most of the plates of plants exhibit also some subject of the animal kingdom. To these our plan does not extend. As Catesby etched all the figures himself, from his own paintings, and the colored copies were at first done under his own inspection, and where it was possible every subject in its natural size: this work was the most splendid of its kind that England had ever produced. We do not know that it had been equalled on the continent, unless by that of Madam *Merian*, which, however, falls greatly short in extent. Seventy-two plates of Catesby's work were copied by the Nuremberg artists, and published in 1750. His "*Observations on Carolina*," &c. were separately printed in folio, at the same place, in 1767.

Catesby was the author of a paper, printed in the 44th volume of *Philosophical Transactions*, page 435, "*On Birds of Passage*," in which, in opposition to the opinion that birds lie torpid in caverns and at the bottom of waters, he produces a variety of reasons, and several facts which his residence in America offered, in support of their migration in search of proper food. His voyages across the Atlantic had taught him the ability of these wanderers to take long flights. He mentions in another place, his having seen hawks, swallows, and a species of owl, in twenty-six degrees of north latitude, at the distance of 600 leagues from land. He shows, that birds before unknown to the country find their way annually into various parts of North America, since the introduction of several kinds of grain; of this the Rice bird, *Emberiza orizivoria*, and the white faced duck, *Anas discors*, are, among others, instances sufficiently known and felt by the inhabitants.

Catesby was elected a Fellow of the Royal Society soon after his second return from America, and lived in acquaintance and

friendship with many of the most respectable members of that body; being "greatly esteemed for his modesty, ingenuity, and upright behavior."

He removed from Hoxton to Fulham, and afterwards to London, and died Dec. 23d, 1749, aged 70, leaving a widow and two children.

His work has been re-published, in 1754 and 1771. To the last edition a Linnæan index has been annexed; but it is by no means so copious or perfect as a work of such merit and magnificence demands.

BOTANICAL GARDENS.

Says Solomon, *I made me gardens and orchards, and I planted trees in them of all kinds of fruits. I made me pools of water to water therewith the trees.*

The island of Crete was the physic garden of Rome. The emperors maintained in that island gardeners and herbarists to provide the physicians of Rome with simples. The establishment of professorships, gave rise, in modern times, to *Botanical gardens;* a new species of luxury to the botanist.

The first public botanical garden of this sort was that of Padua, established in 1533.

The utility of these institutions is self-evident. By public gardens medicinal plants are at the command of the teacher in every lesson; the eye and the mind are perpetually gratified with the succession of curious, scarce, and exotic luxuries; here the botanist can compare the doubtful species, and examine them, through all the stages of growth, with those to which they are allied; and all these advantages are accumulated in a thousand objects at the same time.

The first botanic garden in Switzerland was constructed at Zurich, by *Gesner*, in 1560.

The botanic garden at the University of Oxford was founded in 1632, by *Henry, earl of Danby;* who gave for this purpose five acres of ground, erected green-houses and stoves, endowed handsomely the establishment, and planted in it as supervisor, *Robart*, a German, who published in 1648 *Catalogus Plantarum Horti medici Oxoniensis, &c.*, which contained, if we read rightly, sixteen hundred species.

The botanical garden at Edinburgh was founded by Sir *Andrew Balflour* in 1680; and may be considered as the first introduction of natural history in Scotland. This garden was so successfully cultivated, that it is said to have contained three thousand species of plants, disposed according to Morison's method.

Among those public institutions, which in a singular manner invigorated the spirit of natural history in England, the

Royal Society claims the most distinguished notice. In its design, as in its progress, it was the fostering parent, and guardian of natural knowledge. Such was the respectability of this society, both as a body, and in its individuals, that through its means the whole nation may be said to have amply contributed to its aggrandizements. Under the auspices of this illustrious society, the anatomy and philosophy of plants were illustrated by *Grew* and *Hales.*

We mention, in connection with the Royal Society, the *Physic Garden at Chelsea*, founded by the company of apothecaries in 1673, but which was not effectually constructed till thirteen years after; so slow and gradual is the progress of such institutions at their commencement.

From the time of *Johnson*,* who was the editor of that celebrated English botanist, *Gerard*, a custom had prevailed among the London apothecaries† to form a society each summer, and make excursions to investigate plants. The *Itinera*, published by Johnson, may be considered as the fruit of such expeditions in his day. After the foundation of Chelsea garden this laudable practice was fixed to stated periods, and put under regulations, the herbarizing being now distinguished into private and general. They first begin on the second Tuesday in April; and are held monthly on the same day till September inclusively, in some of the villages in the immediate neighborhood of London. These are for the benefit of pupils. At the end of the season the premium of *Hudson's Flora Anglica* is presented to the young man who has been the most successful in discovering and investigating the greatest number of plants. The general herbarization is annually in July: when the demonstrator and others of the court of assistants belonging to the company, make an excursion to a considerable distance from the city, collect the scarce plants, and dine together near London.

This institution at Chelsea was rendered more stable, and received permanency from the liberality of Sir *Hans Sloane;* who in 1721 gave four acres of ground to the company, on condition that the demonstrator should, in the name of the company, deliver to the Royal Society fifty new plants, till the number should amount to *two thousand;* all specifically different from each other; the list of which was published yearly in the

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* *Johnson* received a degree of M. D. at Oxford in 1643; the year following he was killed in a desperate action with the parliamentary troops. He was lieutenant-colonel in Sir Marmaduke Rawdon's regiment. Botany owes much to this accomplished scholar and soldier.

† In England an apothecary is not, as with us, a vender of drugs; but a practitioner of physic and surgery, and differs principally from a physician in not having taken a degree in medicine.

Philosophical Transactions. The first was printed in 1722, and the catalogues have been continued till 1773; at which time the number of two thousand five hundred and fifty was completed. These specimens are duly preserved in the archives of the society, for the inspection of the curious.

Under excellent superintendents *Chelsea Garden* has flourished; having been excelled perhaps by no public institution of the kind in Europe, for the number of curious exotics it contains. Of this *Miller's Dictionary* affords sufficient proofs. In justice to the memory of those, who filled the place of lecturers and demonstrators in Chelsea garden, we recite the names of the following gentlemen. They were all practitioners in physic.

Isaac Rand	from 1722	to 1729
Joseph Miller	1740	1746
John Wilmer	1747	1767
William Hudson	1765	1769
Stanesby Alchhorne	1770	1772
William Curtis	1773	to his death.

Soon after the restoration of Charles II., a growing taste for the cultivation of exotics sprung up among the great and opulent in England. *Archibald, duke of Argyle*, was one of the first who was conspicuous for the introduction of foreign trees and shrubs. *Evelyn*, both by his writings and example, encouraged the same taste; and the royal gardens at Hampton court were made rich in fine plants. Dr. *Compton, bishop of London*, had a garden richly stored with plants at Fulham; and many private gentlemen vied with each other in these elegant and useful amusements. The growing commerce of the British nation, and the more frequent intercourse with Holland, where immense collections from the Dutch colonies had been made, rendered the gratifications more easily attainable, than before, and from these happy coincidences, science in general reaped great benefit.

We ought not to pass over some eminent British *gardeners*, who, while others were increasing the catalogue of plants and giving accurate descriptions of exotics, were equally serviceable to real science in the art of culture. *Fairchilds*, *Knowlton*, *Gordon*, *Miller*, and *Forsythe*, have distinguished themselves in the useful and healthy* exercise of horticulture. In the xxxii. vol. of Philosophical Transactions there is a paper by Fairchilds on the motion of the sap. Knowlton was gardener to the Earl of Burlington, and was much noticed by Sir Hans Sloane. Several of his communications are to be found in the

* Cadogan says, he never knew a gardener afflieted with the gout, unless he was notoriously intemperate.

Philosophical Transactions. He died in 1782, aged *ninety.* Gordon was eminent for his successful cultivation of exotics. He maintained a correspondence with Linnæus, and has a plant named after him.

The extraordinary merit of *Philip Miller* demands a more particular notice, as he raised himself to an eminence never before equalled by a gardener. He was born in 1691. His father was gardener to the company of apothecaries at Chelsea; and he himself succeeded in that station in 1722. It is not uncommon to give the name of botanist to any man, who can recite by name the plants of his garden; but Mr. Miller rose much above this ordinary attainment. He added to the knowledge of the theory and practice of gardening that of the structure and character of plants, and was early and practically versed in the methods of Ray and Tournefort. To his superior skill in his art we owe the culture and preservation of a variety of fine plants, which, in less skilful hands, would have failed to adorn the conservatories of the curious.

Mr. Miller maintained an extensive correspondence with persons in distant parts of the globe, from the cape of Good Hope to Siberia. He was emphatically styled by foreigners *Hortulanorum Princeps.* His *Gardener's Dictionary* was first published in folio in 1731, and has been translated into various languages; the reception it has every where met with is a sufficient proof of its superiority. Linnæus said of his dictionary, *Non erit Lexicon Hortulanorum, sed Botanicorum.* He was not only a member of the Royal Society, but of its council. This "prince of gardeners" died in 1771, aged eighty years.

While *Padua, Paris, Madrid, Upsal, Oxford, Leyden,* and *Montpelier,* had flourishing botanical gardens, *London,* so celebrated in the annals of science, could boast of no public botanical garden until 1780.

This garden is situated at Queen's Elm, on the road to Fulham. The site must be allowed to have been well chosen, for the grounds lie open to the south and west, except where the plantations are intended to exclude the sun, while the northeast wind, by being impregnated with the *ignited* air of the capital, loses much of its sharpness, and becomes far less pernicious than it would otherwise be, to such plants as require a bland and genial climate. Its extent is about three acres and a half, including the ground occupied by the hot house, green houses and library; and seven acres more, immediately adjoining, and now in the occupation of the proprietor, can at any time be included.

The arrangement is strictly Linnæan; and every tree, shrub and plant, is labelled, so as to afford the advantage of an easy reference to the correspondent numbers in the catalogue.

On approaching from Fulham road, the stranger perceives a door, situated nearly in the middle of the plantation; and, on ringing a bell, will be immediately admitted. A broad walk, extending across the garden, presents a parterre on each side, in which all the different varieties and beautiful hues of Flora are exhibited, in regular gradation, according to the season.

> "Along these blushing borders, bright with hue,
> Fair-handed Spring unbosoms every grace."

No. 1, contains all those plants that are considered useful in agriculture. Persons skilled in this art have an opportunity of seeing, distinctly arranged, with their proper names and species, every tree, grass and shrub, that is cultivated as food for both man and beast. This is a most important branch of natural economy.

No. 2 is the medicinal quarter, in which the student will find the plants of the London and Edinburgh *Dispensatories;* and whether he himself is destined to prescribe, or to make up the prescriptions of others, will here have an opportuity of becoming acquainted with the characters of those herbs which form a part of the *Materia Medica.*

Among the curious ones will be found the *Assafœtida;* while the poisonous tribe, only thirteen of which will thrive in the open air in Britain, are arranged so as to be hereafter detected by simple inspection alone.

No. 3, the foreign grass quarter, contains the Lygeum, Spartum, the Melica Ciliata, the Triticum æstivum, the Juncus niveus, &c.

No. 4, the British grass quarter. Here the agriculturist will, at one view, behold and distinguish those *gramini* which constitute the real wealth and fertility of a country. These include every species serving for food for the horse, the cow, the ass, the sheep, and the goat.

In this interesting collection is to be found the Meadow Foxtail, (the *Alopecurus Pratensis* of Linnæus,) which is the most fattening of this tribe; also the *Anthoxanthum Odoratum*, or the sweet scented vernal meadow grass, that confers a fine aromatic flavor on our hay, together with a complete collection of all the British species of gramina, may be seen in great perfection in this quarter.

No. 5, contains the British plants of large growth.

No. 6, the British wood.

No. 7, is dedicated to British rock plants and aquatics.

No. 8, the hot house and green house. Here may be found the *Dionœa Muscipula*, a fine specimen of which was lately presented to the president of the Linnæan Society, for the purpose of elucidating his lectures at the Royal Institute. They have also the *Strelitzia Reginæ*, so called out of compliment to the

queen; the *Portlandia*, the *Plumieria*, *the Vanilla*, *Catesbea Spinosa*, the *Ipomœa bona nox*, the *Amaryllis reticulata*, together with the *Crinum crubescens*, all in fine bloom.

In the green house is to be met with, the *double Camella Japonica*, the *Phormium tenax*, with a very excellent collection of plants from the Cape of Good Hope and New Holland.

No. 9, the library. This is an oblong building, with a lattice work towards the south, through which it is intended that the ornithologist should be recreated with the view of British birds, and enabled to study their habits and manners while alive.

The collection consists of useful works, either on or immediately connected with the science of botany, in all about 500 volumes, including the most celebrated agricultural works of Young, Marshall, Dickson, &c.

No. 10, a green house, entirely dedicated to heaths, chiefly from the coast of Africa, of which there are one hundred and fifty different species.

No. 11, is appropriated to bulbs and flower roots.

No. 12, foreign annual plants.

No. 13. This quarter contains upwards of one thousand different species of foreign hardy herbaceous plants.

No. 14, foreign Alpine plants.

No. 15, American plants, and foreign wood quarter.

No. 16, is a double border of foreign trees and shrubs, extending all round the boundaries of the garden, on each side of the walk.

The above is intended as a popular rather than a scientific description of a spot, where either the student or the adept may satisfy his curiosity, by means of an arrangement executed in strict conformity to the system of the great Swedish naturalist. Those, also, who delight in the contemplation of nature, are recreated at a very trifling expense; and flowers, plants, and trees, at every season of the year, present an almost endless variety of interesting objects.

Mr. Salisbury is often honored with the presence, not only of some of the first botanists of England and other countries, but also with many of the British nobility; and he has often beheld, with grateful satisfaction, different branches of the royal family, who have honored it with their patronage, walking along the paths, appearing delighted with the arrangement.

Such is, at present, the Botanic Garden at Queen's Elms; in the further improving of which no pains or labor are spared to render it still more useful to the public. It remains for a nation, not only fond of science, but ever considered as its munificent patron and generous protector, to enable the proprietor to complete his plans, extend his views in favor of genius; and finally

to form an establishment equally worthy of science, and of the noted liberality of Great Britain.

A GENERAL LANGUAGE TO DESIGNATE PLANTS.

I have always thought it possible to be a very great botanist, says the celebrated Rousseau, *without knowing so much as one plant by name.* He nevertheless exhorts his pupil to pass from his closet to the gardens and fields, to study the sacred scriptures of nature, instead of books written by men. This famous Genevan had doubtless seen persons who bestowed all their attention on the nomenclature and classification of vegetables, and thought themselves botanists. The celebrated *J. Hunter*,* knew not the names of every individual in the armies of Britain; nor the discriminating mark of each company in each and every regiment; yet he knew most accurately the anatomy and physiology of every individual.

One universal language should be adopted by botanists; and it is important that it should be well understood: but it is absurd to make this the primary object. If the study of plants do not lead to a knowledge of their uses in rural economy, and to their medicinal virtues, the attention to the aspect and names of plants is of very little importance to the public. Before the Spanish overran Mexico, *Montezuma* transplanted innumerable vegetables from the woods and fields into his royal garden; and it was the business of his physicians to investigate and announce the medicinal virtues of his vast collection. Would it not be well, if the philosophers of the north should imitate the wise example of these more than half civilized people of the south?

The first step we should take towards perfecting the science of botany, is to transplant vegetables from our woods, bogs, fields, and, if possible, marshes, into one garden; and then attempt the naturalization of tropical and other exotics. We must not expect to have a garden in which every plant of every country will prosper, or even grow. To effect this we must imagine a garden planted on a mountain directly under the equator, and gradually sloping to the height of more than two miles above the level of the ocean. There every plant of every climate would grow. *Alexander de Humboldt*, a Prussian gentleman, has given us some very interesting facts to this purpose, collected within a few years past, in the equatorial region. The vast range of elevation, from the shores of the Atlantic to the heights of the Andes, affords every possible degree of temperature, and exhibits all the diversity of the vegetable tribes. This distinguished traveler represents the dif-

* Late Surgeon-General in the British army.

ferent kinds of plants as following each other in a regular succession up the mountains.

We are told that the inhabitants of New-Spain distinguished the cultivated part of the country into three zones. 1. The *tierras calientes*, or warm grounds, which never rising above one thousand feet above the sea, have a heat of eighty degrees, and yield abundantly, sugar, indigo, cotton, and plantains or bananas. 2. The *tierras templades*, or temperate grounds which lying on the declivity of the great ridge, at an altitude, from four to five thousand feet, enjoy a mild, vernal temperature, of sixty-eight, or seventy degrees, that seldom varies ten degrees through the whole year. 3. The *tierras frias*, or cold grounds, having an elevation of eight thousand feet, and comprehending the high plains, or table land, such as that of Mexico, of which the temperature is generally under sixty-three degrees, and never exceeds seventy degrees.

ALTITUDE OR LOCATION OF PLANTS.

The following account of the succession of plants from the low grounds up to the boundary of perpetual congelation, as marked on the Andes, we esteem both curious and instructive. They are the remarks of Humboldt as given to the English reader by the Edinburgh Review for 1810.

"Under the equator, from the coast to the height of three thousand feet, grow the *scitamineæ* of Jussieu,—the palms, the sensitive plants, and the most odoriferous of the liliaceous tribe. In that sultry zone, where vegetation wantons in the rankest luxuriance, appear likewise the *theophrasta*, the *hymenæa*, the *cecropia peltata*, the *allionia*, the *conocarpus*, the *convolvulus littoralis*, the *cactus pereskia*, the *sesuvium*, *portulacastrum*, the *toluifera balsamum*, and *cusparia febrifuga*, or the *quinquina* of Carony. Between three thousand and six thousand feet of elevation, occur the *melastomæ*, the *clusiu alba*, the *prunus occidentalis*, the *ficus*, the *moræa*, the *calicarpa*, the *acrosticum*, the *solanum*, the *dolichos croton*, and the *passiflora tomentosa*. Above those limits, the sensitive plant ceases to appear. The tree ferns range from the height of fifteen hundred to that of five thousand feet. The tracts which have an elevation from six to nine thousand feet, and enjoy a mild temperature, varying between thirty-four and seventy-two degrees, produce the *fuchsiæ*, the *lobeliæ*, the *styrax*, the *tropæolum*, the *begonia*, and the *columellæ*. Towards the upper part of that zone, the *acæna*, the *dichondra*, the *nierembergia*, the *hydrocotile*, the *nerteria*, and the *alchemilla*, cover the surface with a fine herbage. This is the region of the oak, or the *quercus granatensis*, which annually sheds its leaves, and from an elevation of nine thousand two hundred feet, never descends near

the equator below that of five thousand five hundred feet, though it occurs, under the parallel of Mexico, at the height of only two thousand six hundred and twenty feet. The *ceroxylon andicola*, or wax-palm, whose trunk is one hundred and eighty feet high, grows on the mountains of Quindiu, from six to nine thousand feet above the sea. Beyond this limit of nine thousand feet, the larger trees of every kind cease to appear. Some dwarfish pines, indeed, rise to near thirteen thousand feet. The several species of the *cinchona*, which furnishes the salutary Peruvian bark, are scattered along the chain of the Andes, over an extent of two thousand miles, at an elevation from two thousand three hundred to nine thousand five hundred feet, and therefore exposed to great variety of climate. The *lancifolia* and *cordifolia* prefer the plains; the *oblongifolia* and *longiflora* occur somewhat higher; but the noted *quinquina* of Loxa, and which Humboldt proposes to name the *cinchona condaminea*, grows at heights from six thousand two hundred and fifty to eight thousand feet, where the mean temperature varies between fifty-nine and sixty-two degrees, on a bottom of micaceous schist in the woods of Caxanuma and Uritucinga. This precious shrub forms one continued forest on the eastern declivity of the Andes, as far as the province of Jaen, and the hills above the river Amazons. Bark of a similar quality is thus obtained from very distinct kinds of the *cinchona ;* in the same manner as the *caoutchouc*, or common elastic gum, is procured from the inspissated juice of a variety of different vegetables—from the ficus, the *hevea*, the *lobelia*, the *castilloa*, and several species of the *euphorbium*. The *wintera* and *escallonia* occur at an altitude from nine thousand two hundred to ten thousand eight hundred feet, and form scrubby bushes in the cold and moist climate at the *paramos*. Above the height of ten thousand five hundred feet, the arborescent vegetables disappear. The alpine plants occupy an elevation from six thousand five hundred to thirteen thousand five hundred feet: there grow the gentians, the *stœlina*, and the *espeletia frailexon*, whose hairy leaves often afford cover to the shivering Indians, when benighted in those upland regions. The grasses appear at a height from thirteen thousand five hundred to fifteen thousand one hundred feet. In this zone, where snow falls at times, the *jarava*, and a multitude of new species of *panicum agrostis*, *avena*, and *dactylis*, cover the soil with a yellow carpet, which the inhabitants call *pajonel*. From the height of about fifteen thousand feet, to the boundary of perpetual congelation, the only plants visible are the linchens which cover the face of the rocks and seem even to penetrate under the snow.

It is a most curious fact, that those plants which seem to

constitute the natural riches of the equatorial regions, are never found growing spontaneously. The *carica papaya*, the *jatropha manihot*, or cassava, the plantain and maize, from which the native Americans drew their principal subsistence, were no where seen by Humboldt in the wild state, nor could he discover the potatoe, though this valuable root is, along with the *chenopodium quinoa*, cultivated in the high country of New-Grenada. In the lower grounds between the tropics, the natives raise cassava, cocoa, maize, and plantains. It is the region of the *mammea*, of oranges, pine-apples, and the most delicious fruits. The Europeans have introduced indigo, sugar, cotton, and coffee, which they cultivate to near the height of five thousand feet above the sea, chiefly by the labor of negro slaves. Indigo and cocoa require great heat, but cotton and coffee will grow at a considerable elevation, and sugar is cultivated even with success in the temperate parts of Quito. This is the habitation of the *cerealia*, or bread-corn. The introduction of wheat into New Spain, is traced to three or four grains which a negro servant of Cortez picked out from among the stores of rice that had been sent from Europe, for subsisting the troops. The monks of Quito still preserve, as a precious relic, the earthen jar in which Father Rixi of Ghent gathered the first crop, from a spot of ground cleared away in front of the convent. Wheat, under the equator, will seldom form an ear below the elevation of four thousand five hundred feet, or ripen it above that of ten thousand eight hundred. Barley is made to grow somewhat higher, but then with the utmost difficulty. Between the altitudes of six and nine thousand feet, lies the climate best suited for the culture of all kinds of European grain. In the same tract is raised the *chenopodium quinoa*. From the elevation of four thousand three hundred feet to that of six thousand two hundred feet, grows the *erythroxylum peruvianum*, whose leaves, called *cocca*, being mixed with quick lime, serve to stimulate the exhuasted force of the Indian, during his long and toilsome journies over the heights of the Andes. In the space between the altitudes of nine thousand eight hundred and thirteen thousand feet, potatoes and the *tropæolum esculentum* are generally cultivated."

IMPRÓVED SYSTEM OF BOTANY, AS TAUGHT AT THE PRESENT DAY.

GENERAL PHYSIOLOGY OF PLANTS.

Phytology, or the physiology of vegetables, may properly be divided into, 1st. The *germination* and *growth* of plants from the seed ; 2. The *propagation* of plants ; 3d. The *increase* of plants, or the enlargement of their volume.

1. *The Germination and Growth of Plants from the Seed.*

If a seed be immersed in warm water for a considerable time, and then subjected to a high magnifying power, the elementary form of the future plant may be seen. In some seeds even the embryo of the future flower becomes manifest. Therefore it may not be absurd to say, that the germination and growth is effected by the development of the embryo plant contained in the seed ; and that this development goes on by means of suc- cesssive supplies of nutriment, which are taken into an organ- ized structure adapted to their reception.

But where shall we stop in our views of these elementary forms? Shall we say, that within the embryo of the future flower which sometimes becomes manifest under the micro- scope, there is probably another seed containing the elementa- ry form of the next generation, and so on *ad infinitum?*

Fortunately, the present state of the science presents the means of fixing the limit in the most satisfactory manner. For noth- ing in the physiology of organized beings is better established, than that a perfect future seed cannot be produced without the application of pollen from a stamen to the pistil of a stigma. But if the future seed were perfect in the present one, such an ope- ration would not be necessary. Therefore, by the aid of the microscope and this established law, we are enabled to infer, that a seed may contain the elements of a future plant as far as the flower and empty tegument of the future seed, and no far- ther.

2. *The Propagation of Plants.*

There are two methods of propagating plants. First, by *re- production;* second, by *continuation.*

1. A plant is *reproduced*, when it grows immediately from the seed. The potatoe is reproduced, when the seed is taken from the berry, planted and grows. Apple trees are reprodu- ced in the nurseries from seeds, &c.

2. A plant is *continued*, when parts taken from its roots, stem, branches, its buds, &c. are transferred to different places, and so cultivated as to continue to grow in several places at the

same time. The living branches or twigs of the same apple tree may continue to grow from the original root and from hundreds of other roots in different countries at the same time. And it is a fact now well established, that those twigs or grafts, however recently inserted, feel the effects of age in the same degree with the twigs remaining on the original tree; all other circumstances being similar.

The roots of potatoes continue in succession in their native torrid regions year after year for a limited period, like the Malaxis and some others of the Orchis family in our latitude. Agriculturists and gardeners aid their progress here, by housing the roots in winter, and setting them in the earth again in the spring season. These too are greatly distributed; so that this plant is vastly extended by the continuation of the same individual. But in due time the effects of age become manifest to the cultivator, and he finds it necessary to reproduce this useful plant from the seed.

The Lombardy popular is becoming enfeebled with age in our country, so that very recent shoots will hardly withstand a severe winter. The reason is manifest. There has never been a pistillate tree introduced from Europe; consequently this tree has never been reproduced here from the seed. We therefore see but the feeble limbs of an exile in dotage though yet sustained in a thousand localities.

3. *The increase of Plants, or the enlargement of their volume.*

After the first season of growing, all woody plants continue to increase their size, if no accident occurs, until age terminates their vital energies. Their volume is not enlarged from an extension of each fibre or pore; but from the annual acquisition of new ones. These new ones are always deposited between the bark and wood.

In the spring season a mucilage is formed between the bark and wood, called the camb, or *cambium*. Towards the decline of the year it becomes considerably indurated, and separates itself into two concentric hollow cylinders of very different thicknesses. The thiner one is attached to the bark, and forms its inner membrane. The thick one is attached to the wood, and becomes the outer layer of the wood for the next year.

It is on this account that those trees which long retain their expanding cuticles, present to our land surveyers those paradoxical magic-like marks. A beech tree, for example, if lettered or figured with a board marker, will present these marks twenty or thirty years afterwards, both on the cuticle and on the wood, of the year when marked; while the intervening layers are sound and without a scar. These interposed woody layers,

originating in mucilage annually deposited between the bark and wood, gradually separate the marked bark and cuticle from the marked wood, while they grow between these marks and become continuous.

ELEMENTARY ORGANS.

Every plant is either phenogamous or cryptogamous.

Phenogamous plants have their stamens and postils sufficiently manifest for examination.

Cryptogamous plants either lose the staminate organs before they become manifest, or they are too minute for inspection.

The *Classes*, *Orders* and *Genera* of the Linnæan system, are founded wholly on the seven elementary organs of fructification.

These are,

1. *Calyx.* The outer or lower part of the flower, generally not colored.*
2. *Corol.* The colored blossom, within or above the calyx.
3. *Stamens.* The organs immediately surrounding or adjoining the central one; consisting of mealy or glutinous knobs, either sessile or supported on filaments.
4. *Pistil.* The central organ of the flower, whose base becomes the pericarp and seed.
5. *Pericarp.* The covering of the seed, whether pod, shell, bag, or pulpy substance.
6. *Seed.* The essential part containing the rudiment of a new plant.
7. *Receptacle.* The base which sustains the other six parts, being at the end of the flower stem.

SUBDIVISIONS OF THE CALYX.

Every calyx is either *monophyllous*, consisting of one leaf, or *polyphyllous*, consisting of more than one leaf.

1. *Perianth.* That calyx which adjoins and surrounds the other parts of the flower, as of the apple, rose, &c. About two thirds of all plants have perianths.
2. *Involucre.* That calyx which comes out at some distance below the flower, and never encloses it. It is commonly at the origin of the peduncles of umbels, and sometimes attached to other aggregate flowers.

   Involucres are either *universal*, placed at the origin of the universal umbel, as in caraway, lovage, &c.; or *par-*

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* In the language of Botany, any part of a plant is not colored when it is green; as the calyx of the apple is said not to be colored, because it is green; and that of the nasturtion is coloured, because it is not green.

tial, placed at the origin of a particular umbel, as in coriander; or *proper*, placed beneath a single flower.

3. *Spathe.* A kind of membrane, which at first encloses the flower, and after it expands is left at a distance below it, as daffodil, onion, Indian turnip.
4. *Glume.* That kind of calyx which is composed of one, two or three valves or scales, commonly transparent at the margin, and often terminated by a long awn or beard. All grasses have glume calyxes.
5. *Ament.* An assemblage of flower-bearing scales, arranged on a slender thread or receptacle; each scale generally constituting the lateral calyx of a flower, as in the willow, chesnut, pine, &c.
6. *Calyptre.* The cap or hood of pistillate mosses, resembling in form and position an extinguisher set on a candle. Conspicuous in the common hair-cap moss.
7. *Volva.* The ring or wrapper at first enclosing the pileus or head of a fungus; and which, after the plant has arrived to maturity, contracts and remains on the stem or at the root.

SUBDIVISIONS OF THE COROL.

Every corol is either *monopetalous*, consisting of one petal or flower-leaf; or *polypetalous*, consisting of more than one.

Monopetalous Corols are,

1. *Bell form.* Hollowed out within the base, and generally diverging upwards, as Canterbury bells, gentian, &c.
2. *Funnel-form.* With a tubular base, and the border opening gradually in the form of a tunnel, as the thorn-apple, the morning glory.
3. *Salver-form.* Having a flat spreading limb or border, proceeding from the top of a tube, as lilac, the trailing arbutus, &c.
4. *Wheel-form.* Having a spreading border without a tube, or with an exceeding short one, as borage, laurel.
5. *Labiate.* A labiate corol is divided into two general parts, somewhat resembling the lips of a horse or other animal. Labiate corols are either *personate*, (with the throat muffled) as snap-dragon; or *ringent*, (with the throat open) as mint, motherwort, catnip, monkey-flower.

Polypetalous Corols are,

1. *Cruciform.* Consisting of four equal petals, spreading out in the form of a cross, as radish, cabbage, mustard, &c.
2. *Caryophylleous.* Having five single petals, each terminat-

ing in a long claw, enclosed in a tubular calyx, as pink, catch-fly, cockle, &c.

3. *Liliaceous.* A corol with six petals, spreading gradually from the base, so as altogether to exhibit a bell-form appearance, as tulip, lily, &c.
4. *Rosaceous.* A corol formed of roundish spreading petals, without claws, or with extremely short ones, as rose, apple, strawberry, &c.
5. *Papilionaceous.* A flower which consists of a banner, two wings and a keel, as pea, clover, &c.

If a corol agrees with none of the above descriptions, it is called *anomalous.*

SUBDIVISIONS OF THE STAMEN.

1. *Anther.* The knob of the stamen, which contains the pollen; very conspicuous in the lily, &c. Never wanting.
2. *Pollen.* The dusty, mealy, or glutinous substance contained in the anthers. Never wanting.
3. *Filament.* That part of the stamen which connects the anther with the receptacle, calyx or pistil. Often wanting.

SUBDIVISIONS OF THE PISTIL.

1. *Stigma.* The organ which terminates the pistil; very conspicuous in the lily, and hardly distinguishable in the Indian corn. Never wanting.
2. *Germ.* That part of the pistil which in maturity becomes the pericarp and the seed, as in the cherry, the pompion. Never wanting.
3. *Style.* That part of the pistil which connects the stigma and the germ; very conspicuous in the lily. Wanting in the tulip and some other flowers.

SUBDIVISIONS OF THE PERICARP.

1. *Silique.* That kind of pod which has a longitudinal partition, with the seeds attached alternately to its opposite edges, as radish, cabbage, &c.
2. *Legume.* A pod without a longitudinal partition, with the seeds attached to one suture only, as the pea, &c.
3. *Capsule.* That kind of percicarp which opens by valves or pores, and becomes dry when ripe, as the poppy, which opens by pores, and the mullein by valves.
4. *Drupe.* That kind of a pericarp which consists of a thick fleshy or cartilaginous coat enclosing a nut or stone, as in the cherry, in which it is said to be *berry-like;* and in the walnut, where it is *dry.*
5. *Pome.* A pulpy pericarp without valves, which contains within it a capsule, as apples, quinces, &c.

6. *Berry.* A pulpy pericarp, enclosing seeds without any capsule, as currant, grape, cucumber, melon.
7. *Strobile.* An ament with woody scales, as the fruit of the pine.

SUBDIVISIONS OF THE SEED.

1. *Cotyledon.* The thick fleshy lobes of seeds; very manifest in beans; whose cotyledons grow out of the ground in the form of two large succulent leaves. Many plants, as Indian corn, wheat, the grasses, &c., have but one cotyledon—mosses, &c. none.
2. *Corcle.* The rudiment of the future plant, always proceeding from the cotyledon; easily distinguished in chesnuts, acorns, &c.
3. *Tegument.* The skin or bark of seeds; it separates from peas, beans, Indian corn, &c. on boiling.
4. *Hilum.* The external mark or scar on seeds, by which they were affixed to their pericarps. In beans and the like it is called the eye.

SUBDIVISIONS OF THE RECEPTACLE.

1. *Proper.* That which belongs to one flower only.
2. *Common.* That which connects several distinct flowrets, as in the sun-flower, daisy, teasel.
3. *Rachis.* The filiform receptacle, connecting the florets in a spike, as in the heads of wheat.
4. *Columella.* The central column in a capsule, to which the seeds are attached.
5. *Spadix.* An elongated receptacle proceeding from a spathe, as Indian turnip.

GENERAL DIVISIONS OF FLOWERS.

1. *Simple.* Having a single flower on a receptacle, as in the quince, tulip, &c.
2. *Aggregate.* Having on the same receptacle several flowers, whose anthers are not united, as teasel, button-bush, &c.
3. *Compound.* Having several florets on the same receptacle, with their anthers united, as sun-flower, China-aster, &c.
4. *Staminate.* Having stamens only, as those in the tassels of Indian corn.
5. *Pistillate.* Having pistils only, as the fertile flower of the cucumber.
6. *Perfect.* Having both stamens and pistils.
7. *Neutral.* Having neither stamens nor pistils.

INFLORESCENCE.

The manner in which Flowers are situated on Plants.

1. *Whorl.* In which the flowers grow around the stem in rings one above another, as motherwort, catnip.
2. *Raceme.* Having the florets on short undivided pedicels, arranged along a general peduncle, as currants.
3. *Panicle.* Having some of the pedicels, along the general peduncle of the raceme, divided, as in oats. A panicle contracted into a compact, somewhat ovate form, as in lilac, is called *thyrse.*
4. *Spike.* Having the florets sessile, or nearly so, on the elongated general receptacle, as wheat, mullein, &c.
5. *Umbel.* Having the flower stems diverging from one place, like the braces of an umbrella, bearing florets on their extremities, as carrot, dill, fennel, &c.
6. *Cyme.* It agrees with the umbel in having its general flower stems spring from one centre, but differs in having those stems irregularly subdivided, as elder, &c.
7. *Corymb.* In the corymb the peduncles take their rise from different heights along the main stem; but the lower ones being longer, they form nearly a level or convex top, as yarrow.
8. *Fascicle.* In general external appearance it resembles the umbel, but the foot stalks are irregular in their origin and subdivisions, as sweet-william.
9. *Head.* In this the flowers are heaped together in a globular form without peduncles, or with very short ones, as clover.

ROOTS AND HERBAGE.

The substance of Roots and Herbage consists of,

1. *Cuticle.* The thin outside coat of the bark, which seems to be without life, and often transparent. Very conspicuous on some kinds of birch, cherry, currant bushes, &c.
2. *Cellular Integument.* The parenchymous substance between the cuticle and bark, often green. Easily seen in the elder, &c. after removing the cuticle.
3. *Bark.* The inner strong fibrous part of the covering of vegetables.
4. *Camb.* The mucilaginous or gelatinous substance, which in the spring of the year, abounds between the bark and the wood of trees.
5. *Wood.* The most solid part of the trunks and roots of herbs and trees.
6. *Pith.* The spongy substance in the centre of the stems and roots of most plants. Large in the elder.

ROOTS are the descending parts of vegetables, and are *annual, biennial*, or *perennial*. They are of seven kinds.

1. *Branching*. Having the whole root divided into parts as it proceeds downwards, as the oak, apple tree, &c.
2. *Fibrous*. The whole root consisting of filiform parts, originating immediately from the base of the stem, as many of the grasses.
3. *Creeping*. Extending itself horizontally, and sending out fibrous radicles, as gill-overground, mint, &c.
4. *Spindle*. Thick at the top and tapering downward, as carrot, parsnip, &c.
5. *Tuberous*. Roots which are thick and fleshy, but not of any regular globular form. They are *knobbed*, as the potatoe; *oval*, as those of orchis; *abrupt*, as the birdsfoot-violet; or *fascicled*, as asparagus.
6. *Bulbous*. Fleshy and spherical. They are either *solid*, as the turnip; *coated*, as the onion; or *scaly*, as the garden lily.
7. *Granulated*. Consisting of several little knobs in the form of grains, strung together along the sides of a filiform radicle, as the wood sorrel.

HERBAGE is all the plant except the *root* and *fructification*. It includes *stems*, *leaves* and *appendages*.

STEMS.

1. *Tidge*, or *proper stem*. The ascending herbage-bearing trunk or stem of all phenogamous plants, except the grasses, as the trunk of the oak, the grape-vine, the mullein-stalk.
2. *Culm*. The stalk or stem of the grasses, as wheat-straw, sugar cane, &c.
3. *Scape*. That kind of flower bearing stem which springs immediately from the root, and is destitute of leaves, as dandelion.
4. *Peduncle*. The flower bearing stem which springs from any part of the stem or branches, as apple, cucumber, &c.
5. *Petiole*. The foot-stalk of the leaf.
6. *Frond*. Applied entirely to cryptogamous plants. It includes the herbaceous, leathery, crustaceous, or gelatinous substance, from which the fruit is produced.
7. *Stipe*. The stem of a fern, of a fungus, of compound egret, and of a pericarp when elevated from the receptacle; as of maiden-hair, of a mushroom, of a dandelion, and of spurge caper.

Leaves *are evergreen or deciduous.*

FORMS OF SIMPLE LEAVES.

1. *Orbicular.* Nearly circular, as the leaves of red clover, of cabbage, &c.
2. *Ovate.* Resembling the longitudinal section of an egg, the base being broader than the extremity. One of the most common forms of leaves.
3. *Oval.* Differing from ovate, in having both ends equal in breadth.
4. *Oblong.* The length more than twice the breadth, and the sides somewhat parallel.
5. *Obovate.* Ovate with the narrowest end towards the stem, as those of red clover.
6. *Cordate.* Heart-shaped, the hind lobes being rounded, as lilac.
7. *Obcordate.* Cordate, with the apex or narrowest end towards the stem, as of wild indigo.
8. *Kidney-form.* Hollowed in at the base, with rounded lobes and rounded ends, as mallows.
9. *Lanceolate.* In the form of the ancient lance, tapering from near the base to the apex, and of some length, as the leaves of most of the willows, of ribwort, &c.
10. *Linear.* Continuing of the same width through nearly the whole length; usually pointed at one or both ends, as most grasses.
11. *Awl-form.* Linear at the base, and becoming more or less curved at the point.
12. *Acuminate.* Any kind of leaf terminating more or less suddenly in a point turned towards one edge of the leaf.
13. *Arrow-form.* Shaped like an arrow-head; differing from cordate in having the hind lobes more or less acute.
14. *Halbert-form.* Hastate. Shaped like an halbert, as field sorrel, creeping snapdragon.
15. *Guitar-form.* Oblong, broadish near the base, and contracted at the sides.
16. *Lobed.* Deeply parted, and the divisions large, with rounded sides or ends, as the white oak.
17. *Palmate.* Resembling the hand with the fingers spread, as horse-chesnut.
18. *Pedate.* Resembling a bird's foot.
19. *Sinuate.* Having the margin hollowed with deep sinuses or bays, as the white oak.
20. *Pinnatifid.* Divided transversely by deep incisions, not extending to the midrib.
21. *Lyrate.* Pinnatifid, with the largest division at the apex, and diminishing from thence to the base, as hedge-mustard.

22. *Runcinate.* Pinnatifid, with the divisions pointing backwards, as dandelion.

EDGES OF LEAVES.

23. *Serrate.* Having sharp notches, resembling saw teeth, along the margin, and pointing towards the apex, as those of cherry trees, roses, &c.
24. *Toothed.* Having projections from the margin of its own substance, which are neither serratures nor crenatures, as those of blue-bottle.
25. *Crenate.* Having uniform notches on the margin of the leaf, which incline towards the apex, or the base, or neither, as gill-overground.

ENDS OF LEAVES.

26. *Emarginate.* Notched at the termination of the midrib.
27. *Retuse.* Emarginate with a shallow sinus.
28. *Obtuse.* Having the apex of the leaf more or less rounded.
29. *Acute.* Terminating in an angle; that is, not rounded.

SURFACES OF LEAVES.

1. *Hairy.* Having distinct straight hairs.
2. *Downy.* Covered with fine cotton-like down.
3. *Silky.* Covered with soft close-pressed hairs.
4. *Bristly.* Set with stiff hairs.
5. *Ciliate.* Edged with parallel hairs or bristles, resembling eye-lashes.
6. *Nerved.* Furnished with midrib-like fibres, running from the base to the apex.
7. *Veined.* Having tendinous fibres variously branched.

POSITIONS OF LEAVES.

1. *Decurrent.* When two edges of the leaf extend along the stem below the place of insertion.
2. *Clasping.* Sessile with the base more or less heart-form, so as entirely or in part to surround the stem.
3. *Sheathing.* With the leaf prolonged down the stem, so as to cover it, in the manner of the grasses.
4. *Perfoliate.* Having the stem passing through the leaf.
5. *Connate.* Leaves opposite, with their bases united.
6. *Peltate.* With the foot stalk attached to the lower side of the leaf, so as to resemble a shield.
7. *Opposite.* Standing at the same height, with base against base.
8. *Whorled.* Surrounding the stem in horizontal rings, or rows.

9. *Imbricate.* Lying over each other, like shingles on a roof, so as to "break joints."
10. *Fascicled.* Growing in bunches from the same point.
11. *Radical.* Proceeding immediately from the root.

COMPOUND LEAVES.

1. *Ternate.* Having three leafets proceeding from the end of one petiole.
2. *Biternate.* Twice ternate; when the petiole is ternate, and each division bears three leafets.
3. *Triternate.* Three times ternate.
4. *Pinnate.* With distinct leafets arranged on opposite sides of the same petiole, as locust.
5. *Bipinnate.* Twice pinnate.
6. *Tripinnate.* Thrice pinnate.
7. *Interruptedly-pinnate.* Having smaller leafets dispersed among the larger, as potatoe.

APPENDAGES.

1. *Stipule.* A leafet or scale at or near the base of a petiole.
2. *Bract.* A leaf among or near the flowers, different from the other leaves of the plant.
3. *Thorn.* A sharp process from the woody part of a plant.
4. *Prickle.* A sharp process from the bark, as those on raspberry bushes, &c.
5. *Sting.* Hair-like processes, mostly from the leaves, as nettles.
6. *Gland.* A roundish, generally minute, appendage to different parts of plants.
7. *Tendril.* The filiform appendage by which climbing plants support themselves on other bodies.

NUMERALS.

The Latin and Greek numerals are so frequently compounded with other words by botanical writers, that an English student ought to commit them to memory, as here laid down.

LATIN.		NOS.	GREEK.	
Unus,		1	Monos,	(single)
Bis,	(twice)	2	Dis,	(twice)
Tres,		3	Treis,	(thrice)
Quatuor,		4	Tettares,	
Quinque,		5	Pente,	
Sex,		6	Ex, (pronounced hex)	
Septem,		7	Epta, (pron. hepta)	
Octo,		8	Octo,	
Novem,		9	Ennea,	

LATIN.	NOS.	GREEK.
Decem,	10	Deka,
Undecem,	11	Endeka,
Duodecem,	12	Dodeka,
Tredecem,	13	Decatreis,
Quatuordecim,	14	Dekatettares,
Quindecim,	15	Dekapente,
Sexdecim,	16	Dekaex,
Septendecim,	17	Dekaepta,
Octodecim,	18	Decaocto,
Novendecim,	19	Decaennea,
Viginti,	20	Eikosi,
Multus,	many.	Polus.

LINNÆAN SYSTEM OF VEGETABLES..

All vegetables are divided into twenty-two* *classes.* These *classes* are divided into *orders. Orders* are divided into *genera. Genera* are divided into *species. Species* are frequently changed into *varieties.* Varieties, however, are more properly within the province of the gardener than of the botanist; at least the method of procuring varieties.

When a botanist finds a plant which he never saw before, and wishes to know its name and uses, he proceeds as follows:

1. He compares the stamens of the unknown flower with the description of each class, until he finds the class to which it belongs.
2. He then goes to the orders of that class and finds its order in the same way.
3. If the order in which he finds his plant is subdivided into sections, he reads the characters of the sections also.
4. Next he goes to the genera of that order or section, and reads their descriptions, until he finds the genus to which it belongs.
5. At last, he looks over the species of that genus, until he finds the exact description of his plant.
6. If he is desirous to compare the plant with its natural associates, and to ascertain its general properties, he refers it to the natural orders of Linnæus, by the first number next to the generic name; or to that of Jussieu, by the second number.

LINNÆAN CLASSIFICATION.

Plants are classified upon two distinct plans—the Artificial and Natural. The object of the Artificial system is merely to

* Linnæus divided them into 24 classes. But farther discoveries, since his death, have proved the classes Polyadelphia and Polygamia to be too uncertain and variable to be any longer retained. Persoon, therefore, and other eminent botanists have rejected them.

furnish a method for ascertaining the name of a plant. The object of the Natural system is to bring together into small groups, plants which resemble each other in their botanical affinities, sensible qualities, and medicinal properties. The Artificial system has been very aptly compared to the dictionary, and the Natural to the grammar of a language.

Artificial Classes.

The Linnæan Artificial Classes are founded upon the four following circumstances of the stamens—*number*, *position*, *relative length*, and *connexion*. The first *eleven* classes are distinguished by the number of stamens—the *twelfth* and *thirteeth* by number and position—the *fourteenth* and *fifteenth* by number and relative length—the *sixteenth*, *seventeenth* and *eighteenth* by connexion—the *nineteenth*, *twentieth* and *twenty-first* by position. The last, or *twenty-second* class, being a natural one, is not distinguished by any circumstance of the stamens.

The first thirteen classes are named by prefixing Greek numerals expressive of the number of stamens to *andria*, which is a Greek derivative, used metaphorically for stamens.

1. *Monandria*, includes those plants which bear perfect flowers, with but one stamen to each—as the blite and samphire. It is a very small class.

2. *Diandria*, includes those plants which bear perfect flowers, with two stamens to each—as hedge-hyssop and lilac. Part of this class of plants bears naked seeds, and forms a natural union with those of the first order of the fourteenth class, as sage, rosemary, mountain mint.

3. *Triandria*, includes those plants which bear perfect flowers, with three stamens to each—as the iris and oats. Most of the grass-like, or culmiferous plants, are included in this class. The rough coarse grasses, as bog-rush and cotton grass, which have closed sheaths or no sheaths to the leaves, have but one style to the pistil; but the finer grasses, as timothy grass and blue grass, which have open sheaths to the leaves, have two styles.

4. *Tetrandria*, includes those plants which bear perfect flowers, with four stamens to each—as plantain and dog-wood. This class is wholly artificial, consequently the plants included in it are easily found out.

5. *Pentandria*, includes those plants which bear perfect flowers with five stamens to each—as comfrey, mullein, tobacco, potatoe, ginseng, parsnip, elder and flax. This is a very extentensive class. It includes a natural assemblage of rough leaved plants, as the borage; of nauseous narcotics, as tobacco and henbane; of umbelliferous narcotics and stomachics, as poison

hemlock, water parsnip and fennel; also many plants which greatly disagree in botanical affinities. The rough leaved and umbelliferous plants of this class resemble each other so nearly, that students find much difficulty in distinguishing the genera.

6. *Hexandria*, includes those plants which bear perfect flowers with six stamens to each—as the lily, tulip, dock, and water plantain.

7. *Heptandria*, includes those plants which bear perfect flowers with seven stamens to each—as the chick wintergreen and horse chesnut. This is a very small class, and the number of stamens variable in most flowers found in it.

8. *Octandria*, includes those plants which bear perfect flowers with eight stamens to each—as the marsh cranberry, nasturtion and buckwheat.

9. *Enneandria*, includes those plants which bear perfect flowers with nine stamens to each—as the sassafras and rhubarb. It is a very small class, and the number of stamens very variable in all the flowers found in it.

10. *Decandria*, includes those plants which bear perfect flowers with ten stamens to each—as the whortleberry, pink, cockle, and poke-weed. Some flowers in this class have but half the number of stamens required, in part of the species of a genus.

11. *Dodecandria*, includes those plants which bear perfect flowers, generally with twelve stamens to each—as the wild ginger or white snake-root, and purslane. If the number of stamens is more than twelve, provided it does not exceed nineteen, still the plant belongs to this class, as the agrimony, mignanette and house-leek. This class has been abolished by some botanists, and the plants included in it distributed among other classes.

12. *Icosandria*, includes those plants which bear perfect flowers with twenty stamens to each, growing on the calyx—as the peach, apple, and thorn. If the number of stamens is more than twenty, provided they are placed on the calyx, still the plant belongs to this class, as the strawberry and the rose. Some flowers in this class have but half the number of stamens required, as some species of thorn, &c.

13. *Polyandria*, includes those plants which bear perfect flowers, with stamens more numerous than those of any other class, growing on the receptacle—as the pond lily, and common St. John's wort. If the number of stamens does not exceed twenty, provided they are not placed on the calyx, still the plant belongs to this class. This is an extensive class, and the number of stamens is more variable in this than in all the other classes. When several flowers on the same plant have a variable number of stamens placed on the receptacle, we may generally pre-

sume that the plant belongs to this class, even if none are found with so many as twenty stamens—as the American cowslip.

The fourteenth and fifteenth classes are named by prefixing the Greek numerals expressive of the number of long stamens, to *dynamia*, which is a Greek derivitive signifying power, importing that the longest stamens are most powerful.

14. *Didynamia*, includes those plants which bear perfect flowers with four stamens to each, two of which are longest—as savory, scull-cap, snap-dragon. This class embraces plants of two very natural assemblages. The first order contains plants with naked seeds, none of which are poisonous; the second order contains plants with seeds in capsules, all of which are said to be poisonous. Most flowers of both orders have labiate corols.

15. *Tetradynamia*, includes those plants which bear perfect flowers with six stamens to each, four of which are longest—as mustard, cabbage and radish. This class embraces a very natural family of plants, bearing cruciform flowers.

The sixteenth and seventeenth classes are named by prefixing Greek numerals, expressive of the number of parcels into which the stamens are united by their filaments, to the word *adelphia*, which is a Greek derivative used to signify brotherhood.

16. *Monadelphia*, includes those plants which bear perfect flowers whose stamens are united laterally by their filaments in one group or set—as the hollyhock and mallows. But if the flowers are papilionaceous, they belong to the next class, even if the stamens are so united, as the lupine. Some species of genera which belong to this class have the stamens broad and membranous at the base, but not attached at all, as some species of geranium. They generally recede from the base of the petals, by approaching the pistil, presenting a columnar form.

17. *Diadelphia*, includes those plants which bear perfect flowers whose stamens are united laterally by their filaments in two groups or sets—as the pea, bean, and locust tree. In most cases nine stamens are united in one set, and one stamen stands alone. In some flowers the stamens are all united in one set, which is the proper character of the preceding class; though if the coral is papilionaceous it belongs here. But if the stamens are not united at all, the plant does not belong here, even if the coral is papilionaceous; as the cassia and wild indigo belong to the tenth class. Genera of the tenth order in this class resemble each other so nearly, that students find considerable difficulty in distinguishing them.

The eighteenth class is named by prefixing *syn*, (a Greek derivative from sun,) signifying together, to *genesia*, a Greek derivative, signifying produced or growing up. The name is intended to signify that the anthers grow up together, or in an united state.

18. *Synginesia*, includes those plants which bear perfect, staminate, pistillate, or neutral florets, in which those bearing anthers have them united laterally, so as to form a hollow cylinder. To this definition should be added, that the plants of this class all bear compound flowers, as the sun-flower, thistle, and dandelion, to exclude the lobelia, some species of violet, the jewel-weed, &c, which belong to the fifth class, though their anthers are united. This is a very extensive and perfectly natural class.

The nineteenth class is named by prefixing an abbreviation of *gynia*, a Greek derivative used metaphorically to signify the pistil, to *andria*, as the stamen and pistil are united in this class.

19. *Gynandria*, includes those plants which bear perfect flowers with the stamens standing on the pistil—as ladies-slipper, and ochris. To this definition should be added, that the stamens are inserted at a distance from the place where the calyx and corol are inserted. For the stamens are inserted on the germ of the pistil in all plants of the class *syngenesia*, &c. but they are inserted in connexion with the corol.

The twentieth and twenty-first classes are named by prefixing Greek numerals expressive of the number of plants occupied by the stamens and pistils in order to complete a species, to *œcia*, a Greek derivative from oikos, a house. The name is intended to signify that the stamens and pistils inhabit the same or different tenements.

20. *Monœcia*, includes those plants which bear imperfect flowers with the staminate and pistillate flowers on the same plant—as the oak, chesnut, and Indian corn.

21. *Diœcia*, includes those plants which bear imperfect flowers, with the staminate and pistillate flowers on separate plants —as the hemp, hop, willow, and poplar.

Most plants of these two last classes are united in one class by Pursh, called *Diclinia*.

The twenty-second class is named by prefixing *Crypto*, a Greek derivative signifying concealed, to *gamia*, a Greek derivative used metaphorically for the strewing of pollen from the anthers upon the stigmas of pistils. It is intended to signify,

that the operation of strewing the fertilizing pollen upon stigmas, so manifest in lilies, poplars, Indian corn, &c., is concealed in plants of this class; though it is probable that such operations are as regularly performed in crytogamous as in phenogamous plants.

22. *Cryptogamia*, includes those plants whose stamens are not manifest, even under the lens. They are known by habit, or natural affinities; as ferns, mosses, liver-worts, sea-weeds, lichens, and fungi.

ARTIFICIAL ORDERS.

Each class is subdivided into two or more orders. These subdivisions are founded upon the number of styles (or stigmas when styles are wanting—the covering or nakedness of seeds—the relative lengths of pods—the comparison between disk and ray florets of compound flowers—and the characters of preceding classes. The orders of the class cryptogamia are distinguished by natural family characters.

The orders of the first thirteen classes are distinguished by the number of styles, and named by prefixing Greek numerals expressive of the number of styles, to *gynia*, a Greek derivative used metaphorically for style or stigma. The styles are numbered at their origin on the germ. Their subdivisions above the germ are not taken into view in determining the number of the order. Sometimes the style is wanting, leaving the stigma to sit down upon the germ; in such cases the stigmas are numbered in determining the number of the order.

1. *Monogynia*, includes those plants in any of the first thirteen classes, which bear flowers with but one style, or one sessile stigma to each—as the samphire in the first class, the lilac in the second, the iris in the third, the plantain in the fourth, the mullein in the fifth, the lily in the sixth, the horse-chesnut in the seventh, the scabish in the eighth, the sassafras in the ninth, the prince's pine in the tenth, the purslane in the eleventh, the cherry in the twelfth, and the poppy in the thirteenth.

2. *Digynia*, includes those plants in any of the first thirteen classes, which bear flowers with two styles, or two sessile stigmas to each—as timothy grass in the third class, and the pink in the tenth class.

3. *Trigynia*, includes those plants in any of the first thirteen classes, which bear flowers with three styles, or three sessile stigmas to each—as the elder in the fifth class, and the buckwheat in the eighth class.

4. *Tetragynia*, includes those plants in any of the first thirteen classes, which bear flowers with four styles or four sessile

stigmas—as the holly in the fourth class, and the lizard's tail in the seventh class.

5. *Pentagynia*, includes those plants in any of the first thirteen classes, which bear flowers with five styles or five sessile stigmas to each—as spikenard in the fifth class, and cockle in the tenth class.

6. *Hexagynia.* We have no plant of this order in our district.

7. *Heptagynia.* We have no plant of this order in our district.

8. *Octogynia.* We have no plant of this order in our district.

9. *Enneagynia.* No plant has ever been found with nine styles.

10. *Decagynia.* We have no plant of this order in our district.

13. *Polyginia*, includes those plants in any of the first thirteen classes, which bear flowers with any number of styles or sessile stigmas above ten—as the house-leek in the eleventh class, the rose in the twelfth, and the crow-foot in the thirteenth.

The orders of the fourteenth and fifteenth classes are but two in each. Those in the fourteenth are named by prefixing *gymno*, a Greek derivative signifying naked, or *angio*, a Greek derivative signifying bag or sack, to *spermia*, a derivative signifying seed. In the fifteenth they are named by using a derivative from the Latin *siliqua*, a pod; and from the diminutive of the same, *silicula*.

1. *Gymnospermia*, includes those plants of the fourteenth class which bear seeds without any pericarp. They generally lie naked in the bottom of the calyx—as of motherwort and hyssop.

2. *Angiospermia*, includes those plants of the fourteenth class which bear seeds in a capsule—as the fox-glove and snapdragon.

1. *Siliculosa*, includes those plants of the fifteenth class which bear silique pods, with the length and breadth nearly equal—as the shepherd's purse.

2. *Siliquosa*, includes those plants of the fifteenth class which bear silique pods, with the length considerably exceeding the breadth, always more than double—as the mustard.

The orders of the sixteenth, seventeenth, nineteenth, twentieth and twenty-first classes, are distinguished by the characters of preceding classes, and assume the same names. Therefore, when a plant is found in either of these five classes, we inquire

which nearest preceding class it would fall into, if its particular classic character were wanting. To answer this inquiry gives the order.

1. *Monandria*, when used for an order in the 16th, 17th, 19th, 20th or 21st class, includes those plants in either of said classes which bear flowers with but one stamen to each—as orchis in the 19th class, and sea eel-grass in the 20th.

2. *Diandria*, when used for an order of the 16th, 17th, 19th, 20th or 21st class, includes those plants in either of said classes which bear flowers with two stamens to each—as ladies'-slipper in class 19, duck-meat in class 20, and willow in class 21.

3. *Triandria*, when used for an order in the 16th, 17th, 19th, 20th or 21st class, includes those plants in either of said classes which bear flowers with three stamens to each—as blue-eyed grass in class 16, Indian corn in class 20, and the fig in class 21.

4. *Tetrandria*, when used for an order in the 16th, 17th, 19th, 20th or 21st class, includes those plants in either of said classes which bear flowers with four stamens to each—as the nettle in the 20th class, and the bayberry in the 21st class.

5. *Pentandria*, when used for an order in the 16th, 17th, 19th, 20th or 21st class, includes those plants in either of said classes which bear flowers with five stamens to each—as the passion-flower in the 16th class, the hog-weed in the 20th, and the hemp in the 21st.

6. *Hexandria*, when used for an order in the 16th, 17th, 19th, 20th or 21st class, includes those plants in either of said classes which bear flowers with six stamens to each—as water-oats in the 20th class, and the green-briar in the 21st.

7. *Heptandria*, when used for an order in the 16th, 17th, 19th, 20th or 21st class, includes those plants in either of said classes which bear flowers with seven stamens to each—as the stork-geranium in class 16.

8. *Octandria*, when used for an order in the 16th, 17th, 19th, 20th or 21st class, includes those plants in either of said classes which bear flowers with eight stamens to each—as the seneca snake-root in class 17, and poplar in class 21.

10. *Decandria*, when used for an order in the 16th, 17th, 19th, 20th or 21st class, includes those plants in either of said classes which bear flowers with ten stamens to each—as the geranium in class 16, and the pea in class 17.

13. *Polyandria*, when used for an order in the 16th, 17th, 19th, 20th or 21st class, includes those plants in either of said classes which bear flowers with more than ten stamens to each—as the holly-hock in class 16, the butternut in class 20, and the moon-seed in class 21.

16. *Monadelphia*, when used for an order in the 20th or

21st class, (it is never used in the 16th, 17th, or 19th,) includes those plants in either of said classes which bear flowers with the stamens united by their filaments in one set—as the cucumber in class 20, and the red cedar in class 21.

The four first orders of class eighteen are distinguished by comparing the disk and ray florets. The first, second and third orders have perfect florets in the disk, the fourth has staminate florets only in the disk. The first has perfect florets in the ray, the second and fourth have pistillate, and the third has neutral. The fifth order has partial perianth calyxes to all the florets; whereas none of the other orders have any but the general calyx—the egret, when present, being a substitute for the perianth. The orders of this class are named by joining the word *polygamia* to an appropriate adjective. Polygamia is a Greek derivative, used metaphorically to signify numerous organs for carrying on the process of strewing the fertilizing pollen upon stigmas. The adjective *æqualis* is used to signify, that the organs for furnishing pollen are equalized, or duly proportioned to the stigmas to be fertilized; *superflua*, that the pistillate florets in the margin or ray are superfluous, each fertile floret of the disk having stamens and pistils in due proportion; *frustranea*, that the ray florets are empty or vain, having no stamens or pistils; *necessaria*, that the ray florets are necessary for the production of seed, the disk florets being all staminate; *segregata*, that the florets are disjoined, or separated from each other by partial calyxes.

1. *Polygamia æqualis*, includes those plants of the 18th class, which bear flowers with perfect florets in both the disk and ray—as the dandelion, thistle, and burdock.

2. *Polygamia superflua*, includes those plants of the 18th class, which bear flowers with perfect florets in the disk, and pistillate florets in the ray—as ox-eyed daisy and yarrow.

3. *Polygamia frustranea*, includes those plants of the 18th class, which bear flowers with perfect florets in the disk, and neutral florets in the ray—as the sunflower and blue-bottle.

4. *Polygamia necessaria*, includes those plants of the 18th class, which bear flowers with staminate florets in the disk, and pistillate florets in the ray—as the pot-marygold, and high-water shrub.

5. *Polygamia segregata*, includes those plants of the 18th class, which bear flowers with a perianth to each floret—as the globe-thistle, and elephant's foot.

The orders of the twenty-second class are distinguished by natural family characters; this class embracing six natural families.

1. *Filices*, includes all the ferns. These plants bear fruit on the back of the leaves, or some part of the leaves seem as it were metamorphosed into a kind of fruit bearing spike—as the brake, and maidenhair. A sub-order, which may be denominated *Apteres*, or *Peteroides*, includes those which bear fruit in a peculiar appendage, as a spike or protuberance in the axils or at the base of the leaves—as ground-pine, scouring-rush, and quill-wort.

2. *Musci*, includes the proper mosses. These plants bear, on leafy stems and branches, one-celled capsules, opening at the top, where they are crowned by a peculiar lid. The capsules do not open by valves, and are generally elevated on stems or stipes, as hair-cap moss.

3. *Hepaticæ*, includes those more succulent moss-like plants which are called liver-worts. They bear four-valved capsules, which distinguishes them from mosses—as brook liver-wort, and platted moss.

4. *Algæ*, includes the sea-weeds and frog-spittle. These plants bear vesiculous or filamentous fruit, mostly in gelatinous fronds. The fruit frequently requires a high magnifying power to be rendered visible—as common sea-weed and river green-hair.

5. *Lichenes*, includes the proper lichens. These plants appear in somewhat circular patches, on stones, trees, and old fences, also in fibres suspended from branches, &c. They are generally pale green, yellow, white, or black: but they are found of all colors. They bear exceedingly minute fruit in receptacles on compact or gelatinous fronds. These receptacles are divided into twelve kinds, translated by Dr. J. E. Smith into clefts, spangles, puffs, buttons, tubercles, hollows, cellules, globules, shields, targets, orbs, and knobs. All of these terms are separately defined in the Vocabulary.

6. *Fungi*, includes such plants as the mushroom, the touchwood, mould, blight, &c. They are destitute of herbage, consisting of a spongy, pulpy, leathery, or woody substance, and bear fruit in a naked dilated membrane, or within the substance of the plant.

Remark. For a more full account of these orders, the reader is referred to the Natural Orders of Jussieu.

N. B. When a star (*) is placed before generic names at the end of an order, it is to be understood that though some species of these genera fall here by the rules of the artificial system, yet that as no natural genus must be divided, these stragglers must be referred back to their natural genera for descriptions. They may thus be referred back by aid of the alphabetical arrangement of generic names, where the species are described.

Note 2. When exercising pupils in the artificial classes, the instructor should direct them to begin by comparing the stamens of the plant under examination with the characters of the highest numbered class, and to proceed downwards towards the first class. Because the characters of the lower classes are sometimes included in the higher.

SYNOPSIS OF ARTIFICIAL CLASSES.

No .of stamens.	1. *Monandria*, 1 stamen in the flower, 2. *Diandria*, 2 stamens. 3. *Triandria*, 3 stamens. 4. *Tetrandria*, 4 stamens. 5. *Pentandria*, 5 stamens. 6. *Hexandria*, 6 stamens. 7. *Heptandria*, 7 stamens. 8. *Octandria*, 8 stamens. 9. *Enneandria*, 9 stamens. 10. *Decandria*, 10 stamens. 11. *Dodecandria*, 12 to 19 stamens.
No. and position.	12. *Icosandria*, about 20 or more, standing on the calyx. 13. *Polyandria*, always 20 or more, on the receptacle.
No. and length.	14. *Didynamia*, 4 stamens, 2 of them uniformly the longest. 15. *Tetradynamia*, 6 stamens, 4 of them uniformly the longest.
Connexion.	16. *Monadelphia*, stamens united by their filaments in one set—anthers generally separate. 17. *Diadelphia*, stamens united by their filaments in two sets, sometimes in one set, with papilionaceous corols. 18. *Syngenesia*, stamens 5, united by their anthers in one set, flowers compound.
Position.	19. *Gynandria*, stamens stand on the germ, style or stigma, separate from the base of the calyx and corol. 20. *Monœcia*, stamens and pistils in separate flowers on the same plant. 21. *Diœcia*, stamens and pistils on separate plants.
Natural.	22. *Cryptogamia*, stamens and pistils so obscure that the plants can only be classed by natural families.

SYNOPSIS OF ARTIFICIAL ORDERS.

ORDERS OF EACH CLASS.

	1st	2d	3d	4th	5th	6th	7th	8th	10th	13th	16th
Class 1	Mon.	Dig.	—	—	—	—	—	—	—	—	—
2	Mon.	Dig.	Tri.	—	—	—	—	—	—	—	—
3	Mon.	Dig.	Tri.	—	—	—	—	—	—	—	—
4	Mon.	Dig.	—	Tet.	—	—	—	—	—	Pol.	—
5	Mon.	Dig.	Tri.	Tet.	Pen.	—	—	—	—	Pol.	—
6	Mon.	Dig.	Tri.	Tet.	—	Hex.	—	—	—	—	—
7	Mon	Dig.	—	Tet.	—	—	Hep.	—	—	—	—
8	Mon.	Dig.	Tri.	Tet.	—	—	—	—	—	—	—
9	Mon.	—	Tri.	—	—	Hex.	—	—	—	—	—
10	Mon.	Dig.	Tri.	Tet.	Pen.	—	—	—	Dec.	—	—
11	Mon.	Dig.	Tri.	Tet.	Pen.	—	—	—	—	Pol.	—
12	Mon.	—	—	—	Pen.	—	—	—	—	Pol.	—
13	Mon.	Dig.	—	—	Pen.	—	—	—	—	Pol.	—
14	Gym.	Ang.	—	—	—	—	—	—	—	—	—
15	Silic.	Siliq.	—	—	—	—	—	—	—	—	—
16	—	—	Tri.	—	Pen.	—	Hep.	—	Dec.	Pol.	—
17	—	—	—	—	Pen.	Hex.	—	Oct.	Dec.	—	—
18	Æq.	Sup.	Frus.	Nec.	Seg.	—	—	—	—	—	—
19	Mon.	Dia.	—	—	Pen.	Hex.	—	—	—	—	—
20	Mon.	Dia.	Tri.	Tet.	Pen.	Hex.	—	—	—	Pol.	Mon.
21	—	Dia.	Tri.	Tet.	Pen.	Hex.	—	Oct.	—	Pol.	Mon.
22	Filices.	Musci.	Hepaticæ.	Algæ.	Lichenes.	Fungi.	—	—	—	—	—

Note. The numbers at the head of this page are used to express the orders directly under them.

NATURAL ORDERS.

Plants of the same natural order agree in habit, and mostly in medicinal properties. When they differ in these properties, the difference is indicated by the odor.

The natural orders of Linnæus are retained, on account of the books in use which refer to them. Jussieu has improved upon Linnæus greatly. Medical students ought to arrange their plants according to Jussieu in the herbarium.

Students should be told, that many plants may possess the qualities of the orders to which they belong, though in a very feeble and scarcely perceptible degree.

NATURAL ORDERS OF LINNÆUS.

(*Definitions.*)

1. *Palmæ.* Palms and their relatives; as cocoanut, frog's-bit. *Farinaceous diet.*

2. *Piperitæ.* Pepper and its relatives. In crowded spikes; as Indian turnip, sweet-flag. *Tonics* and *stomachics.*

3. *Calamariæ.* Reed-like grasses with culms without joints; as cat-tail, sedge. *Coarse cattle fodder.*

4. *Gramina.* The proper grasses with jointed culms; as wheat, rye, oats, timothy-grass, Indian corn. *Farinaceous diet* and *cattle fodder.*

5. *Tripetaloideæ.* Corol three petalled, or calyx three leaved; as water plantain, rush-grass, arrow-head. *Tonics,* and *rough cattle fodder.*

6. *Ensatæ.* Liliaceous plants, with sword-form leaves; as iris, blue eyed grass, Virginian spider-wort. *Antiscorbutics* and *tonics.*

7. *Orchideæ.* With fleshy roots, stamens on the pistils, pollen glutinous, flowers of singular structure, with the germ inferior; as ladies-slipper, arethusa. *Farinaceous diet,* and *stomachics.*

8. *Scitamineæ.* Liliaceous corols, stems herbaceous, leaves broad, germ blunt angular; as ginger, turmeric. *Warming stomachics.*

9. *Spathaceæ.* Liliaceous plants with spathes; as daffodil, onion, snow-drop. *Secernant stimulants.**

10. *Coronariæ.* Liliaceous plants without spathes; as lily, tulip, star-grass. The nauseous scented and bitter are *antiscorbutic* and *cathartic;* the others *emollient.*

11. *Sarmentaceæ.* Liliaceous corols with very weak stems; as smilax, asparagus, bell-wort. *Tonics* and *secernant stimulants.*

12. *Oleraceæ,* or *Holeraceæ.* Having flowers destitute of

* Which promote the secretion of perspirable matter, &c.

beauty, at least of gay coloring; as beet, blight, pig-weed, dock, pepperage. If nauseous, *cathartic;* others, *mild stimulants* and *nutrientics.**

13. *Succulentæ.* Plants with very thick succulent leaves; as prickly-pear, house-leek, purslain. *Antiscorbutic* and *emollient.*

14. *Gruinales.* Corols with five petals, capsules beaked; as flax, wood-sorrel, crane-bill. *Tonics* and *refrigerants.*

15. *Inundatæ.* Growing under water, and having flowers destitute of beauty; as hippuris, pond-weed. *Astringents.*

16. *Calycifloræ.* Plants without corols, with the stamens on the calyx; as poet's cassia, seed buckthorn. *Astringents* and *refrigerants.*

17. *Calycanthemæ.* Calyx on the germ, or growing to it, flowers beautiful; as willow-herb, Ludwigia, Œnothera. *Tonics.*

18. *Bicornes.* Anthers with two straight horns; as whortleberry, spicy and bitter wintergreen, laurel. *Astringents.*

19. *Hesperides.* Sweet-scented, leaves evergreen; as myrtle, cloves, mock-orange. *Astringent* and *stomachic.*

20. *Rotaceæ.* Corals wheel-form; as St. Johnswort. *Tonics.*

21. *Preciæ.* Plants with early spring flowers of an elegant specious appearance; as primrose. *Astringents.*

22. *Caryophylleæ.* Plants with caryophyllous corols; as pink, cockle. *Astringents* and *secernant stimulants.*

23. *Trihilatæ.* Flowers with three stigmas, capsules inflated and winged, and generally three seeded, with distinct hilums; as nasturtion, horse-chesnut. *Tonics* and *nutrientics.*

24. *Corydales.* Corols spurred or anomalous; as fumitory, touch-me-not. *Narcotic* and *antiscorbutic.*

25. *Putamineæ.* Plants which bear shell fruit; as caperbush. *Detergent* and *antiscorbutic.*

26. *Multisiliquæ.* Having several pod-form capsules to each flower; as columbine, larkspur, rue, American cowslip. *Cathartic, narcotic* and *caustic.*

27. *Rhœadeæ.* Plants with caducous calyxes, and capsules or siliques; as poppy, blood-root, celandine. *Anodyne* and *antiscorbutic.*

28. *Luridæ.* Corols lurid, mostly monopetalous; flowers pentandrous or didynamous, with capsules; as tobacco, thorn-apple, nightshade, foxglove. *Narcotic* and *antiscorbutic.*

29. *Campanaceæ,* Having bell-form corols, or those whose general aspect is somewhat bell-form; as morning-glory, bell-

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* Nutrientics of Darwin, which serve as nutriment merely, without producing any extroardinary effects.

flower, violet, cardinal-flower. *Cathartics*, and *secernant stimulants.*

30. *Contortæ.* Corols twisted or contorted; as milk-weed, periwinkle, choke-dog. *Cathartics* and *antiscorbutics.*

31. *Vepreculæ.* Having monophyllous calyxes, colored like corols; as leather-wood, thesium. *Antiscorbutic* and *emetic.*

32. *Papilionaceæ.* Having papilionaceous flowers; as peas, beans, locust-tree, clover. *Emollient*, *diuretic*, *nutrientic.*

33. *Lomentaceæ* Having legumes or loments, but not perfect papilionaceous flowers with united filaments; as cassia, sensitive plant. *Emollient*, *astringent*, *catharitc.*

34. *Cucurbitaceæ.* Fruit pumpkin-like, anthers mostly united; as melons, cucumbers, passion-flower. *Cathartic* and *refrigerant.*

35. *Senticosæ.* Prickly or hairy, with polypetalous corols, and a number of seeds either naked or slightly covered; as rose, raspberry, strawberry. *Astringent* and *refrigerant.*

36. *Pomaceæ.* Having many stamens on the calyx, and drupaceous or pomaceous fruit; as pear, currant, peach, cherry. *Refrigerants.*

37. *Columniferæ.* Stamens united in the form of a column; as hollyhock, mallows, cotton. *Emollient.*

38. *Tricoccæ.* Having three-celled capsules; as castor-oil plant, spurge, box. *Cathartic.*

39. *Siliquosæ.* Having silique pods; as cabbage, mustard, shepherd's purse. *Diuretic*, *Antiscorbutic*, *Nutrientic.*

40. *Personætæ.* Having personate corols; as snap-dragon, monkey-flower. *Deobstruents* and *cathartics.*

41. *Asperifoliæ.* Corols monopetalous, with five stamens, seeds five, naked, leaves rough; as comfrey, stone-seed, (lithospermum.) *Astringents* and *deobstruents.*

42. *Verticillata.* Having labiate flowers; as sage, thyme, catmint, motherwort. *Stomachics* and *astringents.*

43. *Dumosæ.* Bushy pithy plants with small flowers, petals in four or five divisions; as sumach, elder, holly. *Tonic* and *cathartic.*

44. *Sepiariæ.* Having mostly tubular divided corols and few stamens, being ornamental shrubs; as lilac, jasmine. *Astrengent.*

45. *Umbellatæ.* Flowers in umbels, with five-petalled corols, stamens five, styles two, and two naked seeds; as fennel, dill, carrot, poison hemlock. *Stomachic* and *narcotic.*

46. *Hederaceæ.* Corols five-cleft, stamens five to ten, fruit berry-like on a compound raceme; as grape, ginseng, spikenard. *Tonics* and *refrigerants.*

47. *Stellatæ.* Corols four-cleft, stamens four, seeds two, naked, leaves mostly whorled; as bed-straw, dog-wood, venus'-pride. *Tonics* and *deobstruents.*

48. *Aggregatæ.* Having aggregate flowers; as button-bush, marsh rosemary. *Tonics* and *secernant stimulants.*

49. *Compositæ.* All the compound flowers; as sun-flower, boneset, tansey, thistle. *Tonics* and *secernant stimulants.*

50. *Amentaceæ.* Bearing pendant aments; as hazle, oak, chesnut, willow. *Astringents.*

51. *Coniferæ.* Bearing strobiles; as pine, juniper, cedar. *Tonics* and *stomachics.*

52. *Coadunatæ.* Several berry-like pericarps, which are adnate; tulip-tree, magnolia. *Tonics.*

53. *Scabridæ.* Leaves rough, flowers destitute of beauty; as nettle, hemp, hop, elm. *Astringents.*

54. *Miscellaneæ.* Plants not arranged by any particular character; as pond-lily, poke-weed, amaranth. Their qualities are *various.*

55. *Filices.* All ferns; as brakes, maidenhair. *Secernant stimulants.*

56. *Musci.* All mosses; as polytrichum. *Cathartics* and *secernant stimulants.*

57. *Algeæ.* All liverworts, lichens, and sea-weeds; as jungermannia, fucus, usnea. *Tonics.*

58. *Fungi.* All funguses; as mushroom, toad-stool, puff-ball, touch-wood, mould. *Tonics* and *cathartics.*

VEGETABLE SKELETON.

The preparations of leaves, fruits, roots, &c. called vegetable skeletons, are made in this manner. Choose for this purpose the leaves of trees or plants, which are somewhat substantial and tough, and have woody fibres, such as the leaves of orange, jesmine, bay, laurel, cherry, apricot, peach, plum, apple, pear, poplar, oak, and the like; but avoid such leaves as have none of the woody fibres, which are to be separated and preserved by this method; such are the leaves of the vine, lime-tree, and the like. The leaves are to be gathered in the months of June or July, and such to be chosen as are sound and untouched by caterpillars, or other insects. These are to be put into an earthen or glass vessel, and a large quantity of rain-water to be poured over them; and after this they are to be left to the open air, and to the heat of the sun, without covering the vessel. When the water evaporates, so as to leave the leaves dry, more must be added in its place: the leaves will by this means putrefy, but they require a different time for this; some will be finished in a month, and others will require two months or longer, according to the hardness of the parenchyma of them. When they have been in a state of putrefaction some time, the two membranes will begin to separate, and the green part of the

leaf to become fluid : then the operation of clearing is to be performed. The leaf is then to be put upon a flat white earthen plate, and covered with clear water ; and being gently squeezed with the finger, the membranes will begin to open, and the green substance will come out at the edges ; the membranes must be carefully taken off with a finger, and great caution must be used in separating them near the middle rib. When once there is an opening towards the separation, the whole membrane always follows easily : when both membranes are taken off, the skeleton is finished, and it is to be washed clean with water, and then preserved between the leaves of a book.

The fruits are divested of their pulp, and made into skeletons in a different manner. Take, for instance, a fine large pear that is soft, and not strong ; let it be nicely pared without squeezing it, and without hurting either the crown or the stalk ; then put it into a pot of rain-water, cover it, set it over the fire, and let it boil gently till it is perfectly soft, then take it out, and lay it in a dish, filled with cold water ; then hold it by the stalk with one hand, and with the other hand rub off as much of the pulp as you can with the finger and thumb, beginning at the stalk, and rubbing it regularly towards the crown. The fibres are most tender toward the extremities, and therefore to be treated with great care there. When the pulp is thus cleared pretty well off, the point of a fine penknife may be of use to pick away the pulp sticking to the core. In order to see how the operation advances, the foul water must be thrown away from time to time, and clean poured on in its place. When the pulp is in this manner perfectly separated, the clean skeleton is to be preserved in spirit of wine.

Skeletons of roots which have woody fibres, such as turnips, and the like, must be made by boiling the root, without peeling it, till it be soft, then the pulp may be squeezed away by the fingers in the same manner, in a dish of water. Many kinds of roots are thus made into elegant skeletons, and the same method succeeds with the barks of several kinds of trees ; which, when thus treated, afford extremely elegant views of their constitute fibres.

GENERAL RULES FOR AVOIDING POISONS.

Plants not Poisonous.

1. Plants with a *glume* calyx, never poisonous. As wheat, Indian corn, foxtail grass, sedge grass, oats.—*Linnæus.*

2. Plants whose stamens *stand on the calyx*, never poisonous. As curraut, apple, peach, strawberry, thorn.—*Smith.*

3. Plants with *cruciform* flowers, rarely if ever poisonous. As mustard, cabbage, water-cress, turnip.—*Smith.*

4. Plants with *papilionaceous* flowers, rarely if ever poisonous. As pea, bean, locust-tree, wild indigo, clover.—*Smith.*

5. Plants with *labiate* corols, bearing seeds without pericarps, never poisonous. As catmint, hyssop, mint, motherwort, marjoram.—*Smith.*

6. Plants with *compound* flowers, rarely poisonous. As sunflower, dandelion, lettuce, burdock.—*Milne.*

Poisonous Plants.

1. Plants with five stamens and one pistil, with a dull colored *lurid* corol, and of a nauseous sickly smell, always poisonous. As tobacco, thorn-apple, henbane, nightshade. The degree of poison is diminished where the flower is brighter colored and the smell is less nauseous. As potatoe is less poisonous, though of the same genus with nightshade.—*Smith.*

2. *Umbelliferous plants* of the aquatic kind, and of a nauseous scent, are always poisonous. As water-hemlock, cow-parsley. But if the smell be pleasant, and they grow in dry land, they are not poisonous. As fennel, dill, coriander, sweet cicely.—*Smith.*

3. Plants with *labiate* corols and seeds in capsules, frequently poisonous. As snap-dragon, foxglove.—*Smith.*

4. Plants from which issues a *milky juice* on being broken, are poisonous, unless they bear compound flowers. As milkweed, dogbane, Milne's contortæ and lactescentia.

5. Plants having any *appendage* to the calyx or corol, and twelve or more stamens, generally poisonous. As columbine, crowfoot.—*Linnæus.*

Most General Rule.

Plants with few stamens not frequently poisonous, except the number be five; but if the number be twelve or more, and the smell nauseous and sickly, the plants are generally poisonous. Milne's multisiliquæ and sapor.

Note. Many plants possess some degree of the narcotic principle, which are still by no means hurtful.

VOCABULARY.

Abrupt leaf. A pinnate leaf, which has not an odd or terminal leafet.

Accessory. Additional. Annexed, and of a different kind when applied to the border, &c. of the receptacle of a lichen.

Acinaciform leaf. Sabre-form. One edge sharp and convex, the other thicker and straight or concave. Cutlass-form.

Acine. One of the little globules constituting a compound berry; as the raspberry.

Acuminate. Any kind of leaf terminating more or less suddenly in a point turned towards one edge of the leaf.

Acute. Terminating in an angle; that is, not rounded.

Adnate. Adhering. Any two or more parts of the plant being attached to each other.

Aggregate. Having on the same receptacle several flowers, whose anthers are not united, as teasel, button-bush, &c.

Aigrette, Egret. The flying, feathery, or hairy crown of seeds; as the down of thistles and dandelions. It includes whatever remains on the top of the seed after the corol is removed.

——*stiped* (stipulatus) when it is supported on a foot-stem.

——*simple* (simplex) when it consists of a bundle of simple hairs, without branches.

——*plumose* (plumosus) when each hair has other little hairs arranged along its sides, like the beards on a feather.

——*membranous*, thin transparent leaves.

Alternate. Branches, leaves, flowers, &c. are alternate, when arranged upon opposite sides of the stem, or whatever supports them; beginning at different distances from its base, and continuing in nearly equal series. Sometimes they are in three series.

Ament. An assemblage of flower-bearing scales, arranged on a slender thread or receptacle; each scale generally constituting the lateral calyx of a flower—as in the willow, chesnut, pine, &c.

Angular. By means of intervening grooves, the stems, calyxes, capsules, &c. have ridges running lengthwise.

Annual. Which springs up, perfects fruit, and dies in the same year.

Anodynes. Substances which promote sleep.

Anomalous. Whatever forms an exception to the assumed rules or systems.

Anther. The knob of the stamen, which contains the pollen.

Antiscorbutics. Substances which cure eruptions.

Apetalous. A flower without a corol.

Apex. The tip or top end.

Apophysis. A process from the base of the capsule of a moss.

Appendage—*stipule*, a leafet or scale at or near the base of a petiole.

——*bract*, a leaf among or near the flowers, different from the other leaves of the plant.

——*thorn*, a sharp process from the woody part of a plant.

——*prickle*, a sharp process from the bark, as those on raspberry-bushes, &c.

——*sting*, hair-like processes, mostly from the leaves, as nettles.

——*gland*, a roundish, generally minute, appendage to different parts of plants.

——*tendril*, the filiform appendage by which climbing plants support themselves on other bodies.

Aquatic. Growing most naturally in or near water.

Arachnoideus. Resembling a spider web.

Aril, *Arillus*. The outer coat of a seed, which, not contracting with it in ripening, falls off.

Arrow-form. Shaped like an arrow-head, differing from cordate in having the hind lobes more or less acute.

Ascending. Rising gradually between a horizontal and vertical position.

Astringents. Substances which condense the fibres and consolidate relaxed parts. They brace up debilitated intestines, and applied externally restrain bleeding wounds, &c.
Auctus calyx. Having an outer row of leafets, as the dandelion.
Awl-form. Linear at the base, and becoming more or less curved at the point.
Awl-pointed. Acuminate.
Awn. A short slender process or stiff beard, proceeding from the top or back of glumes or chaff.
Axil. The arm-pit. Applied to vegetables, it means the angle formed by the meeting of a leaf or petiole with the stem, or of a branch with the main stem.
Axillary. Any thing growing from the axils.
Banner. The upper petal in a papilionaceous flower.
Bark. The inner strong fibrous part of the covering of vegetables.
Basis. Base. The part of a stem, leaf, flower, &c. nearest to the place through which it derives its nutriment.
Beaked. Terminated by a process formed like a bird's bill.
Bell-form. Hollowed out within the base, and generally diverging upwards, as Canterbury-bells, gentian, &c.
Berry. A pulpy pericarp enclosing seeds without any capsule, as currant, grape, cucumber, melon.
Biennial. Springing up one summer, flowering and dying the next, as wheat.
Bifurcate. Forked twice.
Bipinnate. Twice pinnate.
Bipinnatifid. Doubly pinnatifid. When the divisions of a pinnatifid leaf are cut in, or pinnatifid again.
Biternate. Trice ternate; when the petiole is terminate, and each division bears three leafets.
Boat-form. Hollow one side, with a compressed longitudinal ridge on the opposite side.
Border in Lichens. The edging of their receptacles (apothecium.) It is *proper*, when of the same substance and color of the receptacle. It is *accessory*, when of a different substance or color from the disk of the receptacle.
Bract. See Appendage.
Branching. Having the whole root divided into parts as it proceeds downwards, as the oak, apple-tree, &c.
Bristle-form. Resembling a bristle.
Bristly. Set with stiff hairs.
Bulbous-roots. Fleshy and spherical. They are either solid, as the turnip; coated, as the onion; or scaly, as the garden lily.
Buttons, *Tricæ.* That kind of receptacle of lichens which, when magnified, resembles a coiled horse-hair. They are roundish, sessile, unexpanding, compact, black and solid; continued along their whole surface. Upper side they are in concentric, or coiled, plaited, and twisted folds; covered every where with the same membrane; containing seeds without cells or cases.—*Smith.*
Caducous. Any part of a plant is caducous which falls off earlier, compared with other parts of the same plant, than is usual for similar parts in most plants; as the calyx of the *poppy* falls off before the corol is hardly expanded.
Cæspitose. Turfy. Several plants growing together, or from the same root, forming a turf.
Calycled. See auctus.
Calyptra. The cap or hood of pistillate mosses, resembling in form and position an extinguisher set on a candle. Conspicuous in the common hair-cap moss.
Calyx. The outer or lower part of the flower.
Camb. The mucilaginous or gelatinous substance which in the spring of the year abounds between the bark and the wood of trees.
Capillary. Hair-form; longer than bristle-form, in proportion to its thickness.

CAPITATE. Head-form; growing in heads.

CAPSULE. That kind of pericarp which opens by valves or pores and becomes dry when ripe; as the poppy, which opens by pores, and the mullein by valves.

CARINATE, see keeled.

CARTILAGINOUS. Hard and somewhat flexible. It applies to a leaf, when it is bound around with a strong margin, different from the disk of the leaf.

CARYOPHYLLEOUS. Having five single petals, each terminating in a long claw, enclosed in a tubular calyx as pink, &c.

CATKIN. See ament.

CATHARTICS. Substances which stimulate the intestines so as to hasten and increase evacuations.

CAULINE. Growing on the main stem.

CAUSTICS. Substances which corrode, burn, or dissolve the part with which they come in contact.

CELL. The hollow part or cavity of a pericarp or anther. It is more generally applied to the cavities of pericarps; where seeds are lodged. According to the numbers of these, the pericarps are called *one celled*, *two celled*, &c.

CELLULAR INTEGUMENT. The parenchymous substance between the cuticle and bark, often green. Easily seen in the elder, &c. after removing the cuticle.

CELLULES, *cistulæ*. That kind of receptacle of lichens which is globose, terminal, and formed of the substances of the frond. It is filled with uncoated seeds, intermixed with fibres; at length it bursts irregularly.—*Smith.*

CESPITOSE. See cæspitose.

CHANNELLED. Hollowed out longitudinally with a rounded groove of considerable depth.

CILIATE. Edged with parallel hairs or bristles, resembling eye-lashes.

CLASPING. Sessile with the base more or less heart-form, so as entirely or in part to surround the stem.

CLAVATE. Club-form. Growing larger towards the end.

CLAW. The lower narrow part of a petal, by which it is fixed on the calyx or receptacle. It can exist only in polypetalous corols.

CLEFT. Split down not exceeding half way to the base; with nearly straight edges on both sides of the fissure. The parts into which it is split are numbreed in descriptions; as once split, making two divisions, is called 2-cleft; two splits, 3-cleft, &c.

CLEFTS, *lirellæ*. That kind of receptacle of *lichens* which is open, elongated, sessile, black, very narrow or linear, with a somewhat spongy disk; the border is parallel on each side, and proper. Sometimes it has an accessory border from the crust besides. The *clefts* are either simple and solitary, or aggregate, confluent and branched.—*Smith.*

CLIMBING. Ascending by means of tendrils, as grapes; by leaf-stalks, as virgin's bower; by cauline radicles, or rootlets, as the creeping American ivy, (rhus radicans.) It differs from *twining*, which see.

CLUB-FORM. See Clavate.

COBWEBBED. See arachnoideus.

COCHLEATE. Coiled spirally like a snail-shell.

COILED. Twisted like a rope, or rather resembling the form of one thread of a rope after the other threads are removed.

COLORED. In the language of botany, any part of a plant is not colored when it is green; as the calyx of the apple is said not to be colored, because it is green; and that of the nasturtion is colored, because it is not green.

COLUMELLA. The central column in a capsule, to which the seeds are attached.

COMMISSURE. The joining sides of pairs, as of fennel seeds.

COMMON. Any part is common which serves to include or sustain several parts, similar among themselves

——*perianth.* Including several florets, as in the thistle.

——*involucre.* Surrounding the base of the peduncles in an umbel, which are subdivided above.

This term is often used for *frequent* also.
COMPLETE. Having both calyx and corol.
COMPOUND. Having several florets on the same receptacle, with their anthers united, as sun-flower, china-aster, &c.
CONIC. With a broad base, and approaching a point towards the top.
CONNATE. Leaves opposite, with their bases united.
CONTRARY. See partition.
CONVERGING. Approaching or bending towards each other.
CONVEX. Swelling out in a roundish form.
CORCLE. The rudiment of the future plant, always proceeding from the cotyledon.
CORDATE. Heart-shaped, the hind lobes being rounded, as lilac.
CORIACEOUS. Leathery, or parchment-like.
CORNERED. Having angles or corners. Three-cornered, four-cornered, &c. is often expressed trigonus, &c.
COROL. The colored blossom, within or above the calyx.
CORYMB. In the corymb the peduncles take their rise from different heights along the main stem; but the lower ones being longer, they form nearly a level or convex top, as yarrow.
COTYLEDON. The thick fleshy lobes of seeds; very manifest in beans, whose cotyledons grow out of the ground in the form of two large succulent leaves. Many plants, as Indian corn, wheat, the grasses, &c. have but one cotyledon; mosses &c. none.
COWLED. When the edges meet below and expand above, and generally separate; as the spathe of the *arum*, Indian turnip.
CREEPING. Extending itself horizontally, and sending out fibrous radicles, as gill-overground, mint, &c.
CRENATE. Having uniform notches on the margin of the leaf, which incline towards the apex, or the base, or neither, as gill-overground.
CRESTED. Having an appendage somewhat resembling a cock's comb in form.
CRUCIFORM. Consisting of four equal petals, spreading out in the form of a cross, as cabbage, radish, mustard, &c.
CRYPTOGAMOUS. Cryptogamous plants either lose the staminate organs before they become manifest, or they are too minute for inspection.
CULM. The stalk or stem of the grasses, as wheat-straw, sugar-cane, &c.
CULMIFEROUS. Having culms.
CUP-FORM. Hollow within, resembling a little cup.
CUSPIDATE. Having a sharpened point, and that tipped with a bristle, a prickle, or lengthened apex, not curved. See mucronate, and observe the distinction; also acuminate.
CUTICLE. The thin outside coat of the bark, which seems to be without life, and often transparent. Very conspicuous on some kinds of birch, cherry, currant-bushes, &c.
CYATHIFORM. Wineglass-form. Cylindric, widening gradually upwards—margin not revolute.
CYLINDRIC. A circular shaft of nearly equal dimensions throughout its whole extent.
CYME. It agrees with the umbel in having its general flower stems spring from one centre, but differs in having those stems irregularly subdivided, as elder, &c.
DECIDUOUS. Falling off in the usual season for similar parts to fall; as leaves falling at the decline of the year; corols falling off at the time the stamens fall, &c. See caducous and permanent.
DECUMBENT. When the base is erect, and the remainder lies on the ground. It applies to stems, stamens, &c.
DECURRENT. When two edges of the leaf extend along the stem below the place of insertion.
DECUSSATE. When leaves or branches are opposite in pairs, and each pair stands at right angles with the next pair above or below on the same stem.
DEFLECTED. Bending down archwise.
DEHISCENT. The natural opening of capsules in the proper season.

DELTOID. A leaf with four corners; that is, one at the stem, one at the apex, and one on each side; but the side ones are nearer to the base than to the apex. When the side angles are about as near to the apex as to the base, it is called a *rhomboid* leaf. Both kinds are called *diamond-form* in English.
DENSE. Close, compact. A panicle with abundance of flowers very close, is dense. See thyrse.
DENTATE. Toothed.
DENTICULATE. Having very small teeth.
DEOBSTRUENTS. Substances which remove obstructions.
DETERGENTS. Substances calculated for cleansing.
DIAPHORETICS. Those secernant stimulants which promote perspiration more particularly.
DICHOTOMOUS. Forked. Stem, &c. parted in pairs, each branch parted in pairs again, and so on. When it is parted but once, it is more properly called forked.
DIDYNAMOUS. Belonging to or varying into the class didynamia.
DIFFUSED. Spreading. Expanded in an open loose manner.
DIGITATE. Fingered. When the base of several leafets rests on the end of one petiole; as the strawberry and fivefinger.
DILATED. Expanded, widened.
DIŒCIOUS. Belonging to or varying into the class *diœcia.*
DISCOID. Having a disk without rays.
DISK. The whole surface of a leaf, or of the top of a compound flower, as opposed to its edge or periphery. This term is also applied to the aggregate florets of an umbel.
DISSILIENT. A pericarp is dissilient when it bursts open with a spring, as the touch-me-not, (impatiens.)
DIURETICS. Those secernant stimulants which increase urine more particularly.
DIVARICATE. Branches spreading out from the stem so far as to form more than a right angle with it above.
DORSAL. Fixed to the back. Awns are dorsal, when proceeding from the outside of a glume, and not from the tip.
DOWN, or DOWNY. Covered with fine cotton-like down.
DRUPE. That kind of pericarp which consists of a thick, fleshy, or cartilagenous coat, enclosing a nut or stone, as in the cherry, in which it is said to be *berry-like;* and in the walnut, where it is dry.
DRUPACEOUS. Bearing drupes, or fruit resembling them.
EARED. This term applies, 1st, to the round, extended, or appendaged lobes of a heart-form leaf; 2d, to the side lobes near the base of some leaves; and 3d, to twisted parts, in some ferns and some liverworts, which are supposed to resemble the conchus, or passage into the outer ear.
ECHINATE. Hedgehog-like. Beset with erect prickles.
EGGFORM. See ovate.
EGRET. See aigrette.
ELASTIC. See dissilient.
ELIPTIC. Longer than wide, rounded at or near both ends, and nearly equal in breadth towards both base and apex.
ELONGATED. Lengthened out, as if extended beyond what is usual in similar parts.
EMARGINATE. Notched at the termination of the midrib.
EMETICS. Substances which excite vomiting.
EMOLLIENTS. Substances which soften tumors, or any hardness or dryness of the skin.
ENSIFORM. Sword-form. Two edged, tapering from base to apex mostly, and a little arching towards one edge; as flag and cat-tail, (iris and typha.)
ENTIRE. Continued without interruption. A margin of a leaf, calyx, corol, &c. is entire, when it is neither serrate, toothed, notched, nor in any manner indented.
EQUAL. Similar parts equal among themselves. The calyx, corol, &c. are equal, when the leafets, petals, or subdivisions, are similar in form, size, and direction. Opposed to unequal.

Erect. Upright.
Erose. Gnawed. Unequally sinuated, as if the sinuses had been eaten by insects.
Evergreens. Such plants as retain their leaves throughout the year, as laurel, white pine, &c.
Exotic. Plants not growing spontaneously in a wild state in that particular country, or section of a country.
Exsert. Standing out. Stamens are exsert, when protruded out of the corols.
Factitious character. Added to more essential distinctions.
Families. See gentes.
Fascicle. A bundle. In general external appearance it resembles the umbel; but the foot-stalks are irregular in their origin and subdivisions, as sweet-william.
Fascicled. Producing fascicles, as asparagus.
Fastigiate. Level-topped, or a little convex.
Faux. Jaws. The throat or opening into a corol. That precise spot where the tubular part of a ringent corol begins to separate or expands into lips or mouth, is the faux.
Fibre. Any thread-form part.
Fibrous. The whole root consisting of filiform parts, originating immediately from the base of the stem, as many of the grasses.
Filament. That part of the stamen which connects the anther with the receptacle, calyx, or pistil.
Filiform. Thread-like.
Fissure. A cleft or slitted aperture.
Flexuose. Bending and frequently changing direction.
Floret. Little flower. Whether the flower is large or small, it is a floret, if it is one of a number, all of which constitute an aggregate or compound.
Follicle. A pericarp with one valve, which opens lengthwise on one side only, as milk-weed, (asclepias.)
Foot-stalk. See *peduncle* and *petiole:* it is put for both.
Forked. See dichotomous.
Frond. Applied entirely to cryptogamous plants. It includes the herbaceous, leathery, crustaceous, or gelatinous substance, from which the fruit is produced.
Fructification. The temporary part of vegetables, which is destined for the re-production of the species, terminating the old individual and beginning the new.
Fruit-dots. Assemblages of capsules on the backs of ferns.
Fugacious. Soon disappearing. Flying off.
Funnel-form. With a tubular base, and the border opening gradually in the form of a tunnel.
Furrowed. See sulcate.
Fusiform. Spindle-form. Thick at the top, and tapering downward, as carrot, parsnip, &c.
Galls. Excrescences produced by the stings of insects. The balls found on oaks, which are used in dyeing, the common large green oak balls, the singular green lumps found on the wild honey-suckle, &c. are examples.
Gashed. See incised.
General. See partial.
Generic name. The name of a genus.
Geniculate. Kneed. Forming a very obtuse angle, like a moderate bending of the knee.
Gentes. Nations. Linnæus divided plants into nine great natural tribes or casts. 1. Palms (palmæ,) as the date and cocoa-nut. 2. Grasses (gramina,) as wheat, Indian corn, sugar cane, rice, timothy grass, &c. 3. Lilies (lilia,) as lily, tulip, daffodil, &c. 4. Herbs (herbæ,) as thistles, nettles, peas, mint, potatoes, hemp, plantain, beets, and all other herbaceous plants except the above. 5. Trees (arbores,) as oak, chesnut, pine, willow, dogwood, currants, lilac, whortleberry, cranberry, and all other plants with a woody stem. 6. Ferns (filices,) as brake, polypod, maidenhair, ground

pine, and all other plants of this order, which see. 7. Mosses (musci,) see the order. 8. Algæ. This tribe includes the plants of the orders *hepaticæ*, *algæ* and *lichenes*, which see. 9. Fungi.—as mushroom, toad-stool, puff-ball, mould, blight, &c.

Genus, (plural *genera*.) A number of plants which agree with one another in the habit and structure of the flower and fruit.

Germ. That part of the pistil which in maturity becomes the pericarp and the seed.

Glabrous. Sleek. Having no pubescence.

Gland. A roundish, generally minute, appendage to different parts of plants.

Glaucous. Clothed with a sea-green mealiness, which is easily rubbed off. It is sometimes put for a greenish-grey color.

Globose. Spherical, round on all sides like a ball.

Globules. That kind of receptacle of lichens which is globose, solid and crustaceous, formed of the substance of the frond and terminating its points or branches; from whence they fall off entire, leaving a pit or cavity. They are supposed to be covered all over with a colored, seed-bearing membrane.

Glume. That kind of calyx which is composed of one, two, or three valves or scales, commonly transparent at the margin, and often terminated by a long awn or beard. All grasses have glume calyxes.

Glutinous. Having on some part more or less of adhesive moisture.

Gnawed. See erose.

Granulate. Having several little knobs in the form of grains, strung together along the sides of a filiform radicle, as the wood sorrel.

Grooved. See sulcate.

Guitar-form. Oblong, broadish near the base, and contracted at the sides.

Habitat. The native residence of plants; or the situation wherein they grow most naturally.

Habit. The external appearance of a plant, by a general view of which we know it without attending to any of its essential characters. A knowledge of the habits of plants is to be acquired, by first seeing them in a growing state, and then by repeatedly reviewing them in a *herbarium*.

Halbert-form. Shaped like an halbert.

Hastate. Halbert-form.

Head. In this the flowers are heaped together in a globular form, without peduncles, or with very short ones, as clover.

Herbaceous. Not woody.

Herbage. All the plant except the root and fructification.

Herbarium. A collection of dried plants.

Hexagonal. Six cornered.

Hilum. The external mark or scar on seeds, by which they were affixed to their pericarps. In beans and the like it is called the eye.

Hirsute. Rough-haired.

Hispid. Bristly. Beset with stiff hairs.

Hollows, (thalamia.) That kind of receptacle of lichens, which is spherical, nearly closed, lodged in the substance of the frond, lined with its proper coat, under which are cells 2 or 4-seeded. Each hollow finally opens by an orifice in the surface of the frond above.

Hooded. See cowled.

Horizontal. Parallel to the horizon. Leaves are horizontal, when they form right angles with erect stems.

Horn. See spur.

Imbricate. Lying over each other like shingles on a roof, so as to "break joints."

Imperfect. Wanting the stamen or pistil.

Incised. Cut in like a gash with a knife.

Incurved. Bent inwards.

Indigenous. Plants growing naturally and originally in a country are indigenous to that country.

Indurated. Becoming hard, tough, or leathery.

Inferior. Below. A calyx or corol is inferior when it comes out below the germ. See germ.

INFLATED. Appearing as if blown up with wind.
INFLEXED. The same as incurved.
INFLORESCENCE. The manner in which flowers are situated on plants.
INTERRUPTEDLY PINNATE. Having smaller leafets dispersed among the larger, as potatoe.
INTRODUCED. Not originally native. Brought from some other country.
INVOLUCRE. That calyx which comes out at some distance below the flower, and never encloses it.

Involucres are either *universal*, placed at the origin of the universal umbel, as in caraway, lovage, &c., or *partial*, placed at the origin of a particular umbel, as in coriander; or *proper*, placed beneath a single flower.

Involucres of *ferns* generally lie on the tops of capsules, like a piece of linen spread out to dry. They are said to open inwards, when they separate from the frond so as to leave the capsules naked on the side next the midrib.

INVOLUTE. Rolled inwards.
IRREGULAR. Differing in figure, size, or proportion of parts, among themselves.
KEEL. A ridge resembling the keel of a boat.
KEELED. Having keels, ridged.
KIDNEY-FORM. Hollowed in at the base, with rounded lobes and rounded ends, as mallows.
KNEED. See geniculate.
KNOBS, (cephalodia.) That kind of receptacle of lichens which is convex, more or less globular, covered externally with a colored seed-bearing crust, and placed generally at the extremities of stalks, originating from the frond, permanent; rarely sessile. Sometimes they are at first *spangles* on filamentous lichens, and afterwards become convex irregular knobs. They are simple, compound, or conglomerate.
LABIATE. Divided into two general parts, somewhat resembling the lips of a horse or other animal. Either *personate*, (with the throat muffled) as snapdragon; or *ringent*, (with the throat open) as mint, &c.
LACERATED. Torn. Cut, or apparently torn into irregular segments.
LACUNOSE. Pitted.
LAMINA. Thin plate. The broad upper part of the petal of a polypetalous corol.
LANCEOLATE. In the form of the ancient lance, tapering from near the base to the apex, and of some length, as the leaves of most of the willows, of ribwort, &c.
LANCE-OVATE, &c. Partaking of the lanceolate form, and of that with which it is compounded.
LATERAL. On one side.
LEAFET, or LEAFLET. One of the lesser leaves, which, with others, constitute a compound leaf. A simple leaf is never a leafet, however small.
LEGUME. A pod without a longitudinal partition, with the seeds attached to one suture only, as the pea, &c.
LIGULATE. That kind of floret in some compound flowers, which consists of a single strap-like petal, which becomes tubular at the base only—as all the florets in a dandelion, and the ray florets in a sunflower.
LILIACEOUS. A corol with six petals, spreading gradually from the base, so as altogether to exhibit a bell-form appearance, as tulip, lily, &c.
LIMB. The broad spreading part of the petal of a monopetalous corol.
LINEAR. Continuing of the same width through nearly the whole length, usually pointed at one or both ends, as most grasses.
LION-TOOTHED. See renunciate. Pinnatifid, with the divisions pointing backwards, as dandelion.
LOBE. Divisions, which are rounded, or parted by rounded or curved incisions.
LOBED. Deeply parted, and the divisions large, with rounded sides or ends, as the white oak.
LOMENT. A legume pod with transverse partitions.

Lurid. Of a palish, dull, deathly color. Most plants with lurid petals are more or less poisonous—as tobacco, henbane, thorn apple.

Lyrate. Pinnatifid, with the largest division at the apex, and diminishing thence to the base, as hedge-mustard.

Lyrate-pinnate. Pinnate with the odd terminal leafet largest.

Many. Whenever there are more than are usually numbered; as we say, 1-seeded, 2-seeded, 3-seeded, 4-seeded, many-seeded.

Marcescent. See withering.

Marginated. Having a margin different in some measure from the disk.

Mature. Full grown, but not entered upon a state of decay.

Membranaceous, or Membrane. Made up, apparently, of the two plates of the cuticle, without any cellular integument between them. Nearly transparent, very thin, and often colorless.

Midrib. The main or middle rib of a leaf, running from the stem to the apex.

Monœcious. Belonging to or varying into the class monœcia.

Monopetalous. Consisting of one petal or flower leaf.

Monophyllous. Consisting of one leaf.

Monstrous. Plants producing any part different from the same part when growing wild. As the rose has but five petals in a wild state; but by rich cultivation in gardens, the stamens are mostly changed to petals. Carnations and peony are examples also. These are all monsters.

Mucronate. Having a rounded end, tipped with a prickle, which often appears rather an extension of the midrib.

Muricate. Armed with sharp spines. Covered with subulate prickles.

Naked. Wanting a covering analagous to that of most plants. As a stem without leaves, leaves without pubescence, corol without a calyx, seed without a pericarp, receptacle without chaff, pubescens, &c.

Narcotics. Those poisons which, in small doses, stimulate at first and promote secretions—afterwards induce dullness and sleep; but in large doses, produce delirium, convulsions, and death. Some narcotics inflame the stomach.

Natant. Floating.

Nectary. That part of a flower which secretes honey. It is either a distinct horn, gland, spur, scale, cup, &c. or the claw or some other part of the corol secreting honey. This name is applied to any appendage to the flower, which has no other name.

Nerved. Furnished with midrib-like fibres, running from the base to the apex.

Neutral. Having neither stamens nor pistils.

Nodding. See nutant.

Nucleus. Nut or kernel. The inner seed or kernel is properly the nucleus; and its hard shell is the putamen. But the whole, including the putamen and nucleus, is the nut, *nux*.

Nut. See nucleus.

Nutant. Nodding. When above half of whatever it is applied to droops or hangs down.

Nutrientics. Substances which serve for food.

Obcordate. Cordate, with the apex or narrowest end towards the stem, as of wild indigo

Oblanceolate. Lanceolate, with the base narrowest.

Oblique. A position between horizontal and vertical, or between the perpendicular and the plane of the base. It is also applied to leaves, petals, calyxes, &c. which are, as it were, cut obliquely, or whose bases are shorter on one side than on the other.

Oblong. The length more than twice the breadth, and the sides somewhat parallel.

Obovate. Ovate, with the narrowest end towards the stem, as those of red clover.

Obsolete. When teeth, notches, serratures, &c. are obscure, and appear as if worn out.

Obtuse. Having the apex of the leaf more or less rounded.

Officinalis. Such plants as are sold in the shops for some use, either in medicine or the arts.

Opposite. Standing at the same height, with base against base.

Orbicular. Nearly circular, as the leaves of cabbage, &c.

Orbs. That kind of receptacle of lichens which is flat, orbicular and dilated. of the substance of the frond, terminal, peltate, without a border, but often surrounded with radiating shoots. The membrane or disk under which the seeds are lodged is smooth, nearly of the color of the frond. Spurious orbs, bordered like shields or spangles when young, are sometimes found in the genus *cornicularia.*

Oval. Differing from ovate, in having both ends equal in breadth.

Ovate. Resembling the longitudinal section of an egg, the base being broader than the extremity.

Palmate. Resembling a hand with the fingers spread, as horse-chesnut.

Panicle. Having some of the pedicels, along the general peduncle of the raceme, divided, as in oats. A panicle contracted into a compact, somewhat ovate form, as in lilac, is called *thyrse.*

Papilionaceous. A flower consisting of a banner, two wings and a keel, as pea, clover, &c.

Papillæ. A fleshy process or point.

Papilose. Furnished or covered with fleshy points.

Parallel. Two lines or opposite sides, running nearly equal distances from each other.

Parasitic. Drawing support from another plant. Growing out of another; as the dodder.

Partial. Particular, not general. The perianth, involucre, petiole, &c. of one floret, or of a separate part of all the florets, which with others constitute a compound or aggregate.

Partition. The membrane, &c. which divides pericarps into cells. It is *parallel*, when it unites with the valves, where they unite with each other. It is *contrary* or *transverse*, when it meets a valve in the middle, or in any part not at its suture, or juncture with another.

Parted. Deeply divided, almost to the base.

Pedate. Resembling a bird's foot.

Pedicel. A partial peduncle, or other partial stem.

Peduncle. The flower-bearing stem which springs from any part of the stem or branches, as apple, cucumber.

Peltate With the foot stalk attached to the lower side of a leaf, so as to resemble a shield.

Pendulous. When the whole of the part droops or hangs down.

Perennial. Continuing more than two years.

Perfect flower. Having both stamens and pistils.

Perfoliate. Having the stem passing through the leaf.

Perforate. Having holes as if pricked through, or lucid dots.

Perianth. That calyx which adjoins and surrounds the other parts of the flower, as of the apple, rose, &c.

Pericarp. The covering of the seed, whether pod, shell, bag, or pulpy substance.

Pericheth. Involucre-like leaves surrounding the base of the peduncle of a moss.

Peristome. The fringe, teeth, or membrane, around the mouth of the capsules of mosses, under the lid.

Permanent or persistent. Any part of a plant is permanent, which remains longer compared with other parts of the same plant than is usual for similar parts in most plants. As the calyx of the quince remains on the end of the fruit till it ripens.

Personate. Labiate corols with the throat muffled, as snap-dragon, are personate

Petal. The colored leaf or leaves of the corol. The petal of a monopetalous corol is divided into the *tube* and *limb.* Each petal of a polypetalous corol is divided into the *claw* and *lamina.*

Petal-form. Resembling a petal in shape.

PETIOLE. The foot stalk of the leaf.

PHANEROGAMOUS. PHŒNOGAMOUS. Plants having their stamens and pistils sufficiently manifest for examination.

PILEUS. The hat of a fungus.

PILOSE. Hairy.

PINNATE. With distinct leafets arranged on opposite sides of the same petiole, as locust.

PINNATIFID. Divided transversely by deep incisions, not extending to the midrib.

PISTILLATE FLOWER. Having pistils only—as the fertile flower of the cucumber.

PISTIL. The central organ of the flower, whose base becomes the pericarp and seed.

PITCHER FORM. See urceolate.

PITH. The spongy substance in the centre of the stems and roots of most plants.

PITS, (cyphellæ.) That kind of receptacle of lichens, which consists of open, cup-like, naked, white or yellow little spots, on the under side of the frond, which is generally downy. They are at the first immersed, globose, minute dots, which at length burst with an irregular margin, and discharge a powder.

PLAITED. Folded somewhat like a fan, when nearly full spread.

PLANT. Any substance growing from seed. As trees, grass, puff-ball, mould.

PLICATE. Plaited.

PLUMOSE. Feather-like.

PLUMOSE *egret*. Feather-like down. When a hair of egret has other hairs arranged on opposite sides of it.

POD. That kind of pericarp which is composed of two valves with the seeds attached to one or both sutures, or a longitudinal partition at the edges immediately adjoining the sutures. The pod is either a legume or a silique.

POLLEN. The dusty, mealy, or glutinous substance, contained in the anthers—never wanting.

POLYADELPHIA. (*Polus*, many; *adelphos*, brother.) Many brotherhoods. The name of the abolished eighteenth class, as first established by Linnæus. This class includes all plants with perfect flowers, whose stamens are united by their filaments in three or more sets or brotherhoods.

POLYADELPHOUS. Belonging to or varying into the class polyadelphia.

POLYGAMIA. The name of the twenty-third class as established by Linnæus. It comprises all plants which have some perfect flowers, and others which are staminate and pistillate, or both kinds. This class is divided into three orders. 1. *Monœcia*, having perfect flowers, and either staminate or pistillate ones or both on the same plants. 2. *Diœcia*, having perfect flowers on some plants, and either staminate or pistillate flowers on others of the same species. 3. *Triœcia*, having perfect flowers on some plants, staminate on others, and pistillate on others of the same species. This class, like the 18th, is abolished by Persoon and others, and the plants under it distributed among the other classes

POLYGAMOUS. Varying into or inclining to the class *polygamia*.

POLYPETALOUS. Consisting of more than one petal.

POLYPHILLOUS. Consisting of more than one leaf.

POME. A pulpy pericarp without valves, which contains within it a capsule, as apples, quinces, &c.

PRICKLE. A sharp process from the bark, as those on raspberry bushes, &c.

PRISMATIC. Linear with several flatish sides. A cylinder with flat sides.

PROCESS. A projecting part.

PROCUMBENT. Lying on the ground.

PROLIFEROUS. Putting forth branches or flowers from the centre of the top of a preceding one.

PROPER. That which belongs to one flower only.

PUBESCENT. Hairy. Having hairs, wool, down, glandular hairs, &c.

PUFFS, (pilidia.) That kind of receptacle of lichens which consists of little round bordered knobs, whose disk finally turns to powder. It is at first covered with a membrane and often clothed with a fine grey heariness. These receptacles are elongated below into a stalk fixed to the crust, but totally different from it.
PUNCTATE. Dotted or sprinkled with colored, generally diaphanous, specks. See perforated.
PUTAMEN. Nut shell. See nucleus.
QUALITIES OF PLANTS. Richard says, that plants of the same taste and odor are generally possessed of similar qualities. Also that the smell and taste are always the same. He divides the odors of the plants into, 1. *Fragrant.* 2. *Aromatic.* 3. *Ambrosiac*, (resembling amber.) 4. *Alliaceous*, (resembling garlic.) 5. *Fœtid*, (as asafœtida, &c.) 6. *Nauseous*, (causing the stomach to heave.) As the fragrant, the aromatic and ambrosiac, are always free from all hurtful qualities, and as the fœtid and nauseous are generally poisonous, it seems that mankind have in some measure an instinctive principle by which food is to be selected.
RACEME. Having the florets on short undivided pedicels, arranged along a general peduncle, as currants.
RACHIS. The filaform receptacle, connecting the florets in a spike, as in the heads of wheat.
RADIATE. The spreading florets around the margin of a compound flower—as the sunflower.
RADICAL. Proceeding immediately from the root.
RADICLE. The little fibrous branches proceeding from the main root.
RAY. The outer margin or circumference of a compound flower.
RECEPTACLE. The base which sustains the other parts, being at the end of the flower stem.
RECURVED. Curved downwards.
REFLEXED. Bent back, nearly or quite to touch the stem or peduncle.
REFRIGERANTS. Substances which directly reduce the heat of the body.
REGULAR. See equal.
RENIFORM. See kidney-form.
RESUPINATE. Upside down.
RETICULATE. Netted. Having veins crossing each other like net-work.
RETUSE. Emarginate with a shallow sinus.
RIB. A nerve-like support to a leaf.
RIGID. Stiff, inflexible, or not pliable.
RING. The band around the capsules of ferns which is elastic.
RINGENT. Having the throat open, as mint, motherwort, catnip, monkey-flower.
ROOTS. The descending parts of vegetables, being annual, biennial or perennial.
ROSACEOUS. A corol formed of roundish spreading petals without claws, or with extremely short ones, as rose, apple, &c.
ROTATE. Wheel-form, having a spreading border without a tube, or with an exceeding short one, as borage, laurel.
ROUGH. Covered with dots which are harsh to the touch.
RUGOSE. Wrinkled or humped. Veins more contracted than the disk, so that the intermediate pyrenchyma rises up between them.
RUNCINATE. Pinnatifid, with the divisions pointing backwards, as the dandelion.
SABRE-FORM. See acinaciform.
SAGITATE. Shaped like an arrow head; differing from the cordate in having the hind lobes more or less acute.
SALVER-FORM. Having a flat spreading limb or border, proceeding from the top of a tube, as lilac, &c.
SAMARA. A winged pericarp not opening by valves, as the maple.
SAUCER-FORM. Shaped like a common tea saucer.
SCABROUS. Rough.
SCALY. Covered more or less with scaly appendages, as fern roots; or con-

sisting of substances in some measure resembling coarse fish scales—as the scales of lily roots.

SCAPE. That kind of flower-bearing stem which springs immediately from the root, and is destitute of leaves, as dandelion.

SCARIOUS. Dry and membranous, generally transparent.

SCATTERED. Standing without any regular order.

SCROBICULATE. Deep round pits on the receptacle give it this name.

SECERNANT STIMULANTS. Substances which increase perspiration or promote the secretion of other substances which it is desirable to have evacuated from the system.

SEGMENT. The parts into which a calyx, corol, leaf, &c. is divided or cut.

SERICEUS. Covered with soft close-pressed hairs.

SERRATE. Having sharp notches resembling saw teeth along the margin, and pointing towards the apex, as those of chery trees, roses, &c.

SERRULATE. When a serrate leaf has the teeth serrate again.

SESSILE. Sitting down. When a leaf, flower, seed-down, pileus of a fungus, receptacle of a lichen, &c. are destitute of a petiole, peduncle, stipe, &c.

SETACEOUS. Bristle form.

SETOSE. Bristly.

SHARP. Tapering to a point.

SHEATH. The lengthening a leaf down the stem, which it encloses.

SHEATHING. With the leaf prolonged down the stem so as to cover it, in the manner of the grasses.

SHIELDS, *scuttellæ*. That kind of receptacle of lichens which is open, orbicular, saucer-like. The under side and border are of the substance and color of the frond. The disk is of a different color and substance from the border and frond, containing the seeds in extremely minute vertical cells. The shields are thick and tumid when they are sessile, and membranous when stalked or elevated. Very rarely they are perforated in the centre.

SILICLE. A little silique, whose length and breadth are nearly equal.

SILIQUE. That kind of pod which has a longitudinal partition, with the seeds attached alternately to its opposite edges, as radish, &c.

SILIQUE-FORM. Shaped like a silique, without its essential character.

SILKY. Covered with soft close-pressed hairs.

SIMPLE. Having a single flower on a receptacle, as in the quince, tulip, &c.

SINUATE. Having the margin hollowed with deep sinuses or bays, as the white oak.

SINUATE SERRATE. Having serratures hollowed out

SOLITARY. Standing alone, or very distant from others of the same kind.

SOMEWHAT. Used as a diminutive; implying in some degree not fully. President Smith translates *sub* by *somewhat*, when combined with an adjective; as *subtrifidus*, somewhat three-cleft.

SPADIX. An elongated receptacle proceeding from a spathe, as Indian turnip.

SPANGLES, *patellulæ*. Open and orbicular, like shields, but sessile, and not formed of any part of the crust, from which they differ in color, being most usually black. The seeds are lodged beneath the membrane that covers their disk, as in the former; and the disk is surrounded by a *proper* border. Their seeds are observed to be naked in the cellular substance of the disk, not enclosed in cases. Disk sometimes concave or flat—oftener convex, and even globose, without any apparent border when in an advanced state.

SPATHE. A kind of membrane which at first encloses the flower, and after it expands is left at a distance below it, as daffodil, onion, &c.

SPATULATE. Roundish, and diminishing into a long, narrow, linear base.

SPHERULES. Small globular masses.

SPIKE. Having the florets sessile, or nearly so, on the elongated general receptacle, as wheat, mullein, &c.

SPIKELET. One of the subdivisions of a spike.

SPINDLE-FORM. Thick at the top, and tapering downward, as carrot, parsnip, &c.

SPINOSE. Thorny.

SPIRAL. Twisted like a screw.

SPUR. An elongated process from the base, or from near the base of the calyx, or corol or nectary, somewhat resembling a horn or cock's spur.
SQUARROSE. Ragged. When the points of scales, &c. bend outwards, so as to make a ragged appearance. It is also used for scurfy, or when covered with a bran-like scurf.
STAMENS. The organs immediately surrounding or adjoining the central one; consisting of mealy or glutinous knobs, either sessile or supported on filaments.
STAMINATE. Having stamens only—as those in the tassels of Indian corn.
STELLATE. Spreading out in a radiate manner. Leaves are stellate, when three or more surround the stem in a whorl.
STEM. The main base or supporter of the fructification and herbage.
STIGMA. The organ which terminates the pistil.
STING. Hair-like processes, mostly from the leaves, as nettles.
STIPE. The stem of a fern, of a fungus, of compound egret, and of a pericarp when elevated from the receptacle.
STIPULE. A leafet or scale near the base of a petiole.
STOMACHICS. Substances which directly excite and strengthen the action of the stomach.
STRIATE, STREAKED. Marked or grooved with slender lines.
STRIGOSE. Armed with small, close, rigid bristles, which are thickest below.
STROBILE. An ament with woody scales, as the fruit of the pine.
STYLE. That part of the pistil which connects the stigma and the germ.
SUB. Used in combination as a diminutive for somewhat.
SUBULATE. Linear at the base, and becoming more or less curved at the point.
SULCATE, *sulcatus*. Furrowed—marked with deep lines.
SUPERIOR. A calyx or corol is superior when it proceeds from the upper part of the germ.
SUTURE. A seam-like appearance at the meeting of two parts, as the valves of pea pods.
SWORD-FORM. See ensiform.
TEGUMENT. The skin or bark of seeds.
TENDRIL. The filiform appendage by which climbing plants support themselves on other bodies.
TERETE. Round, columnar, and tapering from the base to the other end.
TERMINAL. Proceeding from, or occupying, the end of a stem, branch, style, &c.
TERNATE. Having three leafets proceeding from the end of one petiole.
THORN, OR SPINE, A sharp process from the bark, as those on raspberry-bushes &c.
THROAT. See faux.
THYRSE. A panicle contracted into a compact, somewhat ovate form, as in lilac.
TIDGE. The ascending herbage-bearing trunk or stem of all phenogamous plants, except the grasses, as the trunk of the oak, the grape vine, the mullein stalk.
TOMENTOSE. Covered with fine downy or cottony substance, matted together.
TONICS. Substances which give strength to the system. They are stimulants which are permanent in their operation.
TOOTHED. Having projections from the margin of its own substance, which are neither serratures nor crenatures—as those of blue-bottle.
TORULOSE. With swelling ridges or humps, like the muskmellon, or horse-radish pod.
TRANSLUCENT. Transmitting light faintly.
TRANSVERSE. Crosswise.
TRIANGULAR. Having three angles or corners. It is applied to a leaf with three points or corners.
TRIPINNATE. Thrice pinnate.
TRIPINNATIFID. A pinnatifid leaf, with the divisions pinnatifid, and those latter divisions pinnatifid again.
TRITERNATE. Three times ternate.

TRUNCATE. The end appearing as if cut off.
TUBE. The lower hollow cylinder of a monopetalous corol.
TUBERCLES. That kind of receptacles of lichens which is spherical or slightly conic, nearly closed, crustaceous, black; more or less immersed in the surface of the crustaceous frond, which it elevates; or sometimes it is exposed, being merely sessile. Each contains a ball or mass of connected seeds, destitute of cells, enveloped in a common membrane. The whole mass of seeds is at length discharged together by an orifice at the top of the tubercle. We often find these tubercles after the seeds are discharged.
TUBEROUS. Roots which are thick and fleshy, but not of any regular globular form.
TUBULOUS, TUBULOSE. That corol of a compound flower which forms a whole tube, not a ligulate floret. It is also applied to a perianth, if the whole or the lower part is a hollow cylinder.
TURBINATE Top form.
TURGID. Thickened, swollen, but not inflated.
TWINING. Ascending spirally.
VALVE. The several pieces of a pericarp which separate naturally on ripening are called valves; also, the leaves or chaffs of a glume. Each piece is called a valve. This name is sometimes applied to the scales which close the tube in some corols.
VARIETY. The changes produced among plants of the same species by accidental causes—as by soil, situation, culture, climate, &c. These changes respect *magnitude, fulness* of flowers, *crisping* of leaves, *color*, *taste*, and *smell*. If the same kind of plant can possibly be produced from the seed of other kinds, these are but varieties of the same species. All apples are but varieties of the same species.
VAULTED. Arched over like the roof of the mouth.
VEINED. Having tendinous fibres variously branched.
VENTRICOSE. Swelling out as if blown up with wind.
VERTICAL. Standing or hanging up and down at right angles with the horizon—or parallel to the stem.
VESICULAR. Containing or consisting of a cellular substance.
VILLOSE. Having a superficial covering of long, soft, whitish hairs.
VISCID. Covered superficially with a sticky juice.
UMBEL. Having the flower stems diverging from one place, like the braces of an umbrella, bearing florets on their extremities, as carrot, dill, fennel.
UMBELLIFEROUS. Bearing umbels, as carrot, dill, fennel.
UMBILLICATE. Having a kind of central roundish hollow or protuberance, as on the end of an apple or of a pompion.
UNARMED. Having no thorns or prickles.
UNDULATE. Wavy.
UNEQUAL. The parts not corresponding in size, form and duration.
VOLVA. The ring or wrapper at first enclosing the head of a fungus; and which, after the plant has arrived at maturity, contrasts and remains on the stem or at the root.
URCEOLATE. Swelling out like a pitcher, and not contracting much at top.
URN-FORM. Swelling in the middle, and contracting at the top—as the calyx of the rose.
UTRICLES. The little bag-like reservoirs for sap.
UTRICULUS. A little bladder.
WEDGE-FORM. Obovate with straightish sides.
WHEEL-FORM. Having a spreading border without a tube, or with an exceeding short one, as borage, laurel.
WHORLED. Surrounding the stem in numbers at intervals; as the leaves of bedstraw and the flowers of motherwort.
WINGS. The two side petals in a papilionaceous corol.
WITHERING. Having a shriveled and decaying appearance, though not actually in a state of decay; as the flowers of elm.
WOOD. The most solid part of the trunks and roots of herbs and trees.
ZIGZAG. See flexuose.

THE GROWTH AND EXTRACTIVE MATTER OF VEGETATION.

Vegetable. *Vegetabilis.* One of the three great divisions of nature. The most obvious difference between vegetables and animals is, that the latter are, in general, capable of conveying themselves from place to place; whereas vegetables, being fixed in the same place, absorb, by means of their roots and leaves, such support as is within their reach.

The nutrition or support of plants appears to require water, earth, light, and air. There are various experiments which have been instituted to show, that water is the only aliment which the root draws from the earth. Van Helmot planted a willow, weighing fifty pounds, in a certain quantity of earth covered with sheet lead; he watered it for five years with distilled water; and at the end of that time the tree weighed one hundred and sixty-nine pounds three ounces, and the earth in which it had vegetated was found to have suffered a loss of no more than three ounces. Boyle repeated the same experiment upon a plant, which at the end of two years weighed fourteen pounds more, without the earth in which it had vegetated having lost any perceptible portion of its weight.

Duhamel and Bonnet supported plants with moss, and fed them with mere water; they observed, that the vegetation was of the most vigorous kind; and the naturalist of Geneva observes, that the flowers were more odoriferous, and the fruit of a higher flavor. Care was taken to change the supports before they could suffer any alteration. Tillet has likewise raised plants, more especially of the gramineous kind, in a similar manner, with this difference only, that his supports were pounded glass, or quartz in powder. Hales has observed, that a plant which weighed three pounds gained three ounces after a heavy dew. Do we not every day observe hyacinths and other bulbous plants, as well as gramineous plants, raised in saucers or bottles containing mere water? And Braconnot has lately found mustard-seed to germinate, grow and produce plants, that came to maturity, flowered and ripened their seed, in litharge, flowers of sulphur, and very small unglazed shot. The last appeared least favorable to the growth of the plants, apparently because their roots could not penetrate between it so easily.

All plants do not demand the same quantity of water; and nature has varied the organs of the several individuals conformably to the necessity of their being supplied with this food. Plants which transpire little, such as the mosses and the lichens, have no need of a considerable quantity of this fluid; and accordingly they are fixed upon dry rocks, and have scarcely any roots; but plants which require a larger quantity, have

roots which extend to a great distance, and absorb humidity throughout their whole surface.

The leaves of plants have likewise the property of absorbing water, and of extracting from the atmosphere the same principle which the root draws from the earth. But plants which live in the water, and as it were swim in the element which serves them for food, have no need of roots; they receive the fluid at all their pores; and we accordingly find, that the fucus, the ulva, &c. have no roots whatever.

The dung which is mixed with earths, and decomposed, not only affords the alimentary principles we have spoken of, but likewise favours the growth of the plant by that constant and steady heat which its ulterior decomposition produces. Thus it is that Fabroni affirms his having observed the development of leaves and flowers in that part of the tree only, which was in the vicinity of a heap of dung.

From the preceding circumstances it appears, that the influence of the earth in vegetation is almost totally confined to the conveyance of water, and probably the elastic products from putrefying substances, to the plant.

Vegetables cannot live without air. From the experiments of Priestley, Ingenhousz, and Sennebier, it is ascertained, that plants absorb the azotic part of the atmosphere; and this principle appears to be the cause of the fertility which arises from the use of putrefying matters in the form of manure. The carbonic acid is likewise absorbed by vegetables, when its quantity is small. If in large quantity, it is fatal to them.

Chaptal has observed, that carbonic acid predominates in the fungus, and other subterraneous plants. But, by causing these vegetables, together with the body upon which they were fixed, to pass, by imperceptible gradations, from an almost absolute darkness, into the light, the acid very nearly disappeared; the vegetable fibres being proportionally increased, at the same time that the resin and coloring principles were developed, which he ascribes to the oxygen of the same acid. Sennebier has observed, that the plants which he watered with water impregnated with carbonic acid, transpired an extraordinary quantity of oxygen, which likewise indicates a decomposition of the acid.

Light is almost absolutely necessary to plants. In the dark, they grow pale, languish, and die. The tendency of plants towards the light is remarkably seen in such vegetation as is effected in a chamber or place where the light is admitted on one side; for the plant never fails to grow in that direction. Whether the matter of light be condensed into the substance of plants, or whether it act merely as a stimulus or agent, whithout which

the other requisite chemical processes cannot be effected, is uncertain.

It is ascertained, that the processes in plants serve, like those in animals, to produce a more equitable temperature, which is for the most part above that of the atmosphere. Dr. Hunter, quoted by Chaptal, observed, by keeping a thermometer plunged in a hole made in a sound tree, that it constantly indicated a temperature several degrees above that of the atmosphere, when it was below the fifty-sixth division of Fahrenheit; whereas the vegetable heat, in hotter weather, was always several degrees below that of the atmosphere. The same philosopher has likewise observed, that the sap which, out of the tree, would freeze at 32 degrees, did not freeze in the tree unless the cold augmented 15 degrees more.

The vegetable heat may increase or diminish by several causes, of the nature of disease; and it may even become perceptible to the touch in very cold weather, according to Buffon.

The principles of which vegetables are composed, if we pursue their analysis as far as our means have hitherto allowed, are chiefly carbon, hydrogen, and oxygen. Nitrogen is a constituent principle of several, but for the most part in small quantity. Potassa, soda, lime, magnesia, silex, alumina, sulphur, phosphorus, iron, manganese and muriatic acid, have likewise been reckoned in the number; but some of these occur only occasionally, and chiefly in very small quantities; and are scarcely more entitled to be considered as belonging to them than gold, or some other substances, that have been occasionally procured from their decomposition.

The following are the principal products of vegetation:

1. *Sugar.* Crystalizes. Soluble in water and alcohol. Taste sweet. Soluble in nitric acid, and yields oxalic acid.

2. *Sarcocol.* Does not crystalize. Soluble in water and alcohol. Taste bitter sweet. Soluble in nitric acid, and yields oxalic acid.

3. *Asparagin.* Crystalizes. Taste cooling and nauseous. Soluble in hot water. Insoluble in alcohol. Soluble in nitric acid, and converted into bitter principle and artificial tannin.

4. *Gum.* Does not crystalize. Taste insipid. Soluble in water, and forms mucilage. Insoluble in alcohol. Precipitated by silicated potassa. Soluble in nitric acid, and forms mucous and oxalic acids.

5. *Ulmin.* Does not crystalize. Taste insipid. Soluble in water, and does not form mucilage. Precipitated by nitric and oxymuriatic acids in the state of resin. Insoluble in alcohol.

6. *Inulin.* A white powder. Insoluble in cold water. Soluble in boiling water; but precipitates unaltered after the so-

lution cools. Insoluble in alcohol. Soluble in nitric acid, and yields oxalic acid.

7. *Starch.* A white powder. Taste insipid. Insoluble in cold water. Soluble in hot water; opaque and glutinous. Precipitated by an infusion of nutgalls; precipitate redissolved by a heat of 120 deg. Insoluble in alcohol. Soluble in dilute nitric acid, and precipitated by alcohol. With nitric acid yields oxalic acid and a waxy matter.

8. *Indigo.* A blue powder. Taste insipid. Insoluble in water, alcohol, æther. Soluble in sulphuric acid. Soluble in nitric acid, and converted into bitter principle and artificial tannin.

9. *Gluten.* Forms a ductile elastic mass with water. Partially soluble in water; precipitated by infusion of nutgalls and oxygenized muriatic acid. Soluble in acetic acid and muriatic acid. Insoluble in alcohol. By fermentation becomes viscid and adhesive, and then assumes the properties of cheese. Soluble in nitric acid, and yields oxalic acid.

10. *Albumen.* Soluble in cold water. Coagulated by heat, and becomes insoluble. Insoluble in alcohol. Precipitated by infusion of nutgalls. Soluble in nitric acid. Soon putrefies.

11. *Fibrin.* Tasteless. Insoluble in water and alcohol. Soluble in diluted alkalies, and in nitric acid. Soon putrefies.

12. *Gelatin.* Insipid. Soluble in water. Does not coagulate when heated. Precipitated by infusion of galls.

13. *Bitter Principle.* Color yellow or brown. Taste bitter. Equally soluble in water and alcohol. Soluble in nitric acid. Precipitated by nitrate of silver.

14. *Extractive.* Soluble in water and alcohol. Insoluble in æther. Precipitated by oxygenized muriatic acid, muriate of tin, and muriate of alumina; but not by gelatin. Dyes fawn color.

15. *Tannin.* Taste astringent. Soluble in water and in alcohol of 0.810. Precipitated by gelatin, muriate of alumina, and muriate of tin.

16. *Fixed oils.* No smell. Insoluble in water and alcohol. Forms soaps with alkalies. Coagulated by earthy and metallic salts.

17. *Wax.* Insoluble in water. Soluble in alcohol, æther, and oils. Forms soap with alkalies. Fusible.

18. *Volatile oil.* Strong smell. Insoluble in water. Soluble in alcohol. Liquid. Volatile. Oily. By nitric acid inflamed, and converted into resinous substances.

19. *Camphor.* Strong odor. Crystalizes. Very little soluble in water. Soluble in alcohol, oils, acids. Insoluble in alkalies. Burns with a clear flame, and volatilizes before melting.

20. *Birdlime.* Viscid. Taste insipid. Insoluble in water. Partially soluble in alcohol. Very soluble in æther. Solution green.

21. *Resins.* Solid. Melt when heated. Insoluble in water. Soluble in alcohol, æther, and alkalies. Soluble in acetic acid. By nitric acid converted into artificial tannin.

22. *Guaiacum.* Possesses the characters of resins; but dissolves in nitric acid, and yields oxalic acid and no tannin.

23. *Balsams.* Possesses the characters of resins; but have a strong smell; when heated, benzoic acid sublimes. It sublimes also when they are dissolved in sulphuric acid. By nitric acid converted into artificial tannin.

24. *Caoutchouc.* Very elastic. Insoluble in water and alcohol. When steeped in æther, reduced to a pulp which adheres to every thing. Fusible and remains liquid. Very combustible.

25. *Gum resins.* Form milky solutions with water, transparent with alcohol. Soluble in alkalies. With nitric acid converted into tannin. Strong smell. Brittle, opaque, infusible.

26. *Cotton.* Composed of fibres. Tasteless. Very combustible. Insoluble in water, alcohol, and æther. Soluble in alkalies. Yields oxalic acid to nitric acid.

27. *Suber.* Burns bright, and swells. Converted by nitric acid into suberic acid and wax. Partially soluble in water and alcohol.

28. *Wood.* Composed of fibres. Tasteless. Insoluble in water and alcohol. Soluble in weak alkaline lixivium. Precipitated by acids. Leaves much charcoal when distilled in a red heat. Soluble in nitric acid, and yields oxalic acid.

To the preceding we may add, emetin, fungin, hematin, nicotin, pollenin; the new vegetable alkalies, aconita, atropia, brucia, cicuta, datura, delphia, hyosciama, morphia, picrotoxia, strytchnia, veratria; and the various vegetable acids.

MATTER.

"*The Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life; and man became a living soul.*" Gen. II, chap. 7.

We shall *first* treat of the four elements, as matter; *secondly*, the elements, or matter organized; *thirdly*, the elements or matter animated, or with life; and *fourthly*, the diseases to which the elements or matters become subject in consequence of animation.

Man is formed of the four elements, earth, water, air and fire, and which we divide into two classes, viz: *passive* and *active*, or *matter without and with organization and motion.* *Earth* and *water* being the *passive*, and *fire* and *air* the *active*. The union of which produce the peculiar *ens*, *quintescence* or *irritability* and *excitability*, that is called life, and thus a forced state of existance is commenced and is maintained for a time, when it is decomposed and returns to earth again to nourish and invigorate other bodies in its turn. In this species of green-house state of existence, we are compelled constantly to be tempering our bodies to the various vicissitudes of atmosphere to which we are subject, by adding to or diminishing the quantity and quality of our clothing, as well as our fuel, food and every other convenience that is desirable to make life tolerable, in so frail a body, during its transitory abode upon earth.

The earth and water being the component parts; (*The Lord God formed man of the dust of the ground.*) The fire and air keep him in motion by excitement and irritation; (*and breathed into his nostrils the breath of life,* and man became a living soul.*) We shall first analyze the passive part, viz: earth and water, and then in due course, the active or exciting principle, fire and air. After which, it is our design, to exhibit different portions of the human body in miniature in *anatomy* and *physiology*, in order to give the reader a more just conception of the animated mass of creation of which he forms so minute a portion.

We shall also examine the different functions of animal organization and motion, together with the five senses, with the powers of speech, to express the different passions and wants to other animated matter, thus constituting the perfect man.

1st. THE PASSIVE:

OR, EARTH AND WATER, AND THEIR COMPONENT PARTS.

Although there seems to be an almost infinite variety of earthy substances scattered on the surface of this globe, yet when we examine them with a chemical eye, we find, not

* Vitality.

without surprise, that all the earth and stones which we tread under our feet, and which compose the largest rocks, as well as the numerous different specimines which adorn the cabinets of the curious, are composed of a very few simple or elementary earths. "Analysis has shown, that the various stony or pulverulent masses, which form our mountains, valleys, and plains, might be considered as resulting from the combination or intermixture, in various numbers and proportions, of nine primitive earths, to which the following names were given:

*1. Barytes. 2. Strontites. 3. Lime. 4. Magnesia. 5. Alumina, or clay. 6. Silica. 7. Glucina. 8. Zirconia. 9. Yttria.

Alkalies, acids, metallic ores, and native metals, were supposed to be of an entirely dissimilar constitution.

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1. BARYTES.

*(From *Barys*, heavy; so called because it is very preponderous.) *Cauk; Calk; Terra ponderosa; Baryta.* Ponderous earth; Heavy earth. United with the sulphuric acid, it forms the mineral called *sulphate of barytes*, or *baroselenite*. When united to carbonic acid, it is called *aerated barytes*, or *carbonate of barytes*. See *Heavy spar*.

Barytes, is a compound of barium and oxygen. Oxygen combines with two portions of barium, forming, 1. *Barytes*. 2. *Deutoxide of barium*.

1. *Barytes*, or *protoxide of barium*, "is best obtained, by igniting, in a covered crucible, the pure crystalized nitrate of barytes. It is procured in the state of hydrate, by adding caustic potassa or soda to a solution of the muriate of nitrate. And barytes, slightly covered with charcoal, may be obtained by strongly igniting the carbonate and charcoal mixed together in fine powder. Barytes obtained from the ignited nitrate is of a whitish-gray color; more caustic than strontites, or perhaps even lime. It renders the syrup of violets green, and the infusion of tumeric red. Its specific gravity by Fourcroy is 4. When water in small quantity is poured on the dry earth, it slakes like quicklime, but perhaps with evolution of more heat. When swallowed it acts as a violent poison. It is destitute of smell.

When pure barytes is exposed, in a porcelain tube, at a heat verging on ignition, to a stream of dry oxygen gas, it absorbs the gas rapidly, and passes to the state of deutoxyde of barium. But when it is calcined in contact with atmospheric air, we obtain at first this deutoxyde and carbonate of barytes; the former of which passes very slowly into the latter, by absorption of carbonic acid from the atmosphere.

2. The *deutoxyde of barium* is of a greenish-gray color, it is caustic, renders the syrup of violets green, and is not decomposable by heat or light. The voltaic pile reduces it. Exposed at a moderate heat to carbonic acid, it absorbs it, emitting oxygen, and becoming carbonate of barytes. The deutoxyde is probably decomposed by sulphuretted hydrogen at ordinary temperatures. Aided by heat, almost all combustible bodies, as well as many metals, decompose it. The action of hydrogen is accompanied with remarkable phenomena.

Water at 50° F. dissolves one-twentieth of its weight of barytes, and at 212° about one-half of its weight. It is colorless, acrid, and caustic. It acts powerfully on the vegetable purples and yellows. Exposed to the air, it attracts carbonic acid, and the dissolved barytes is converted into carbonate, which falls down in insoluble crusts.

Sulphur combines with barytes, when they are mixed together, and heated in a crucible. The same compound is more economically obtained by igniting a mixture of sulphate of barytes and charcoal in fine powder. This sulphuret is of a reddish yellow color, and when dry without smell. When this substance is put into hot water, a powerful action is manifested. The water is

The brilliant discovery by Sir. H. Davy, in 1808, of the metallic basis of potassa, soda, barytes, strontites, and lime,

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decomposed, and two new products are formed, namely, hydrosulphuret, and hydroguretted sulphuret of barytes. The first crystalizes as the liquid cools, the second remains dissolved. The *hydrosulphuret* is a compound of 9.75 of barytes with 2.125 sulphuretted hydrogen. Its crystals should be quickly separated by filtration, and dried by pressure between the folds of porous paper. They are white scales, have a silky lustre, are soluble in water, and yield a solution having a greenish tinge. Its taste is acrid, sulphureous, and when mixed with the hydroguretted sulphuret, eminently corrosive. It rapidly attracts oxygen from the atmosphere, and is converted into the sulphate of barytes. The *hydroguretted sulphuret* is a compound of 9.75 barytes with 4.125 bisulphuretted hydrogen: but contaminated with sulphite and hyposulphite in unknown proportions. The dry sulphuret consists probably of 2 sulphur +9.75 barytes. The readiest way of obtaining barytes water is to boil the solution of the sulphuret with deutoxyde of copper, which seizes the sulphur, while the hydrogen flies off, and the barytes remains dissolved.

Phosphuret of barytes may be easily formed by exposing the constituents together to heat in a glass tube. Their reciprocal action is so intense as to cause ignition. Like phosphuret of lime, it decomposes water, and causes the disengagement of phosphuretted hydrogen gas, which spontaneously inflames with contact of air. When sulphur is made to act on the deutoxyde of barytes, sulphuric acid is formed, which unites to a portion of the earth into a sulphate.

The salts of barytes are white, and more or less transparent. All the soluble sulphates cause in the soluble salts of barytes a precipitate insoluble in nitric acid. They are all poisonous except the sulphate ; and hence the proper counter-poison is dilute sulphuric acid for the carbonate, and sulphate of soda for the soluble salts of barytes."

Pure barytes has a much stronger affinity than any other body for sulphuric acid ; it turns blue tincture of cabbage green. It is entirely fusible by heat alone, but melts when mixed with various earths. Its specific gravity is 4.000. It changes quickly in the air, swells, becomes soft, and falls into a white powder, with the acquisition of about one-fifth of its weight. This slaking is much more active and speedy than that of lime. It combines with phosphorus, which compound decomposes water rapidly. It unites to sulphur by the dry and humid way. It has a powerful attraction for water, which it absorbs with a hissing noise, and consolidates it strongly. It is soluble in twentimes its weight of cold, and twice its weight of boiling water. Its crystals are long four-sided prisms of a satin like appearance. It is a deadly poison to animals.

2. STRONTIA.

(So called because it was first found in a lead mine at Strontian, in Scotland.) A grayish white-colored earth, found in combination with carbonic acid, in the mineral called Strontianite.

Pure Strontia is of a grayish-white color ; a pungent, acrid taste ; and when powdered in a mortar, the dust that rises irritates the lungs and nostrils. Its specific gravity approaches that of barytes. It requires rather more than 160 parts of water at 60 deg. to dissolve it ; but of boiling water much less. On cooling, it crystalizes in thin, transparent, quadrangular plates, generally parallelograms, seldom exceeding a quarter of an inch in length, and frequently adhering together. The edges are most frequently bevelled from each side. Sometimes they assume a cubic form. These crystals contain about .68 of water ; are soluble in 51.4 times their weight of water at 60 deg., and in little more than twice their weight of boiling water. They give a blood-red color to the flame of burning alcohol. The solution of strontia changes vegetable blues to a green. Strontia combines with sulphur either in the wet or dry way, and its sulphuret is soluble in water.

In its properties, strontia has a considerable affinity to barytes. It differs from it chiefly in being infusible, much less soluble, of a different form, weak-

subverted the ancient ideas regarding the earth, and taught us to regard them as all belonging, by most probable anologies, to the metallic class.

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er in its affinities, and not poisonous. Its saline compounds afford differences more marked.

The basis of strontia is *strontium*, a metal first procured by Sir H. Davy, in 1808, precisely in the same mannner as barium, to which it is very analogous, but has less lustre. It appeared fixed, difficultly fusible, and not volatile. It became converted into strontia by exposure to air, and when thrown into water, decomposed it with great violence, producing hydrogen gas, and making the water a solution of strontia. By igniting the mineral strontianite intensely with charcoal powder, strontia is cheaply procured.

3. LIME.

Calx. 1. The oxide of calcium, one of the primitive earths. It is found in great abundance in nature, though never pure, or in an uncombined state. It is always united to an acid, and very frequently to the carbonic acid, as in chalk, common lime-stone, marble, calcareous spar, &c. It is contained in the waters of the ocean; it is found in vegetables; and is the basis of the bones, shells, and other hard parts of animals. Its combination with sulphuric acid is known by the name of sulphate of lime (*gypsum*, or plaster of Paris). Combined with flouric acid it constitutes fluate of lime, or Derbyshire spar.

Properties.—Lime is in solid masses, of a white color, moderately hard, but easily reducible to powder. Its taste is bitter, urinous and burning. It changes blue cabbage juice to a green. It is unalterable by the heat of our furnaces. It splits and falls into powder in the air, and loses its strong taste. It is augmented in weight and in size by slowly absorbing water and carbonic acid from the atmosphere. Its specific gravity is 2.3. It combines with phosphorus by heat. It unites to sulphur both in the dry and humid way. It absorbs sulphuretted hydrogen gas. It unites with some of the metallic oxides. Its slaking by water is attended with heat, hissing, splitting and swelling up, while the water is partly consolidated and partly converted into vapor; and the lime is reduced into a very voluminous dry powder, when it has been sprinkled with only a small quantity of water. It is soluble when well prepared in about 450 parts of water. It unites two acids. It renders silex and alumine fusible, and more particularly these two earths together.

Method of obtaining Lime.—Since the carbonic acid may be separated from the native carbonate of lime, this becomes a means of exhibiting the lime in a state of tolerable purity. For this purpose, introduce into a porcelain, or earthern retort, or rather into a tube of green glass, well coated over with lute, and placed across a furnace, some powdered Carara marble, or oyster-shell powder. Adapt to its lower extremity a bent tube of glass, conveyed under a bell. If we then heat the tube, we obtain carbonic acid gas; and lime will be found remaining in the tube or retort.

The burning of lime in the large way, depends on the disengagement of the carbonic acid by heat; and, as lime is infusible in our furnaces, there would be no danger from too violent a heat, if the native carbonate of lime were perfectly pure; but as this is seldom the case, an extreme degree of heat produces a commencement of vitrification in the mixed stone, and enables it to preserve its solidity, and it no longer retains the qualities of lime, for it is covered with a sort of crust, which prevents the absorption of the water when it is attempted to be slaked. This is called over-burnt lime.

In order to obtain lime in a state of very great purity, the following method may be had recourse to.

Take Carara marble, or oyster shells; reduce them to powder, and dissolve the powder in pure acetic acid; precipitate the solution by carbonate of ammonia. Let the precipitate subside, wash it repeatedly in distilled water, let it dry, and then expose it to a white heat for some hours.

The acetic acid, in this operation, unites to the lime, and forms acetate of lime, disengaging at the same time the carbonic acid, which flies off in the

To the above nine earthy substances, Berzelius has lately added a tenth, whic he calls *thorina*. Whatever may be the

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gaseous state: on adding to the acetate of lime carbonate of ammonia, acetate of ammonia, and an artificial carbonate of lime are formed; from the latter the carbonic acid is again expelled, by exposure to heat, and the lime is left behind in a state of perfect purity.

4. MAGNESIA.

1. The ancient chemists gave this name to such substances as they conceived to have the power of attracting any principle from the air. Thus an earth which, on being exposed to the air, increased in weight, and yielded vitriol, they called *magnesia vitriolata:* and later chemists, observing in their process for obtaining magnesia, that nitrous acid was separated, and an earth left behind, supposing it had attracted the acid, called it *magnesia nitri*, which, from its color, soon obtained the name of *magnesia alba*.

2. The name of one of the primitive earths, having a metallic basis, called magnesium. It has been found native in the state of hydrate.

Magnesia may be obtained by pouring into a solution of its sulphate a solution of subcarbonate of soda, washing the precipitate, drying it, and exposing it to a red heat. It is usually procured in commerce, by acting on magnesian limestone with the impure muriate of magnesia, or bittern of the sea-salt manufactories. The muriatic acid goes to the lime, forming a soluble salt, and leaves behind the magnesia of both the bittern and limestone. Or the bittern is decomposed by a crude subcarbonate of ammonia, obtained from the distillation of bones in iron cylinders. Muriate of ammonia and subcarbonate of magnesia result. The former is evaporated to dryness, mixed with chalk, and sublimed. Subcarbonate of ammonia is thus recovered, with which a new quantity of bittern may be decomposed; and thus, in ceaseless repetition, forming an elegant and economical process. 100 parts of crystalized Epsom salt, require for complete decomposition 56 of subcarbonate of potassa, or 44 dry subcarbonate of soda, and yield 16 of pure magnesia after calcination.

Magnesia is a white, soft powder. Its sp. gr. is 2.3 by Kirwan. It renders the syrup of violets, and infusion of red cabbage, green, and reddens turmeric. It is infusible, except by the hydroxygen blow-pipe. It has scarcely any taste, and no smell. It is nearly insoluble in water; but it absorbs a quantity of that liquid with the production of heat. And when it is thrown down from the sulphate by a caustic alkali, it is combined with water constituting a hydrate, which, however, separates at a red heat. It contains about one-fourth its weight of water.

When magnesia is exposed to the air, it very slowly attracts carbonic acid. It combines with sulphur, forming a sulphuret.

The metallic basis, or magnesium, may be obtained in the state of amalgam with mercury by electrization.

When magnesia is strongly heated in contact with 2 volumes of chlorine, this gas is absorbed, and one volume of oxygen is disengaged. Hence it is evident that there exists a combination of magnesium and chlorine, or a true chloride. The salt called muriate of magnesia is a compound of the chloride and water. When it is acted on by a strong heat, by far the greatest part of the chlorine unites to the hydrogen of the water, and rises in the form of muriatic acid gas; while the oxygen of the decomposed water combines with the magnesium to form magnesia.

Magnesia is often associated with lime in minerals, and their perfect separation becomes an interesting problem in analysis.

Properties.—Pure magnesia does not form with water an adhesive ductile mass. It is in the form of a very white spongy powder, soft to the touch, and perfectly tasteless. It is very slightly soluble in water. It absorbs carbonic acid gradually from the atmosphere. It changes very delicate blue vegetable colors to green. Its attraction to the acids is weaker than those of the alkalies. Its salts are partially decomposed by ammonia, one part of the magnesia being precipitated, and the other forming a triple compound. Its specific gravity is about 2.3. It is infusible even by the most intense heat; but when

revolutions of chemical nomenclature, mankind will never cease to consider as *earths*, those solid bodies composing the

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mixed with some of the other earths it becomes fusible. It combines with sulphur. It does not unite to phosphorus or carbon. It is not dissolved by alkalies in the humid way. When heated strongly, it becomes phosphorescent. With the dense acids it becomes ignited. With all the acids it forms salts of a bitter taste, mostly very soluble.

5. ALUMINA.

Alumine. *Terra Alumina.* Earth of alum. Pure clay. One of the primitive earths, which, as constituting the plastic principle of all clays, loams, and boles, was called argil, or the argillaceous earth, but now, as being obtained in greatest purity from alum, is styled alumina. It was deemed elementary matter till Sir H. Davy's celebrated electro-chemical researches led to the belief of its being, like barytes and lime, a metallic oxyde.

The purest native alumina is found in the oriental gems, the sapphire and ruby. They consist of nothing but this earth and a small portion of coloring matter. The native porcelain clays or kaolins, however white and soft, can never be regarded as pure alumina. They usually contain fully half their weight of silica, and frequently other earths. To obtain pure alumina we dissolve alum in 20 times its weight of water, and add to it a little of the solution of carbonate of soda, to throw down any iron which may be present. We then drop the supernatant liquid into a quantity of the water of ammonia, taking care not to add so much of the aluminous solution as will saturate the ammonia. The volatile alkali unites with the sulphuric acid of the alum, and the earthy basis of the latter is separated in a white spongy precipitate. This must be thrown on a filter, washed, or edulcorated, as the old chemists expressed it, by repeated affusions of water, and then dried. Or if an alum, made with ammonia instead of potassa, as is the case with some French alums, can be got, simple ignition dissipates its acid and alkaline constituents, leaving pure alumina.

Alumina prepared by the first process is white, pulverulent, soft to the touch, adheres to the tongue, forms a smooth paste without grittiness in the mouth, insipid, inodorous, produces no change in vegetable colors, insoluble in water, but mixes with it readily in every proportion, and retains a small quantity with considerable force; is infusible in the strongest heat of a furnace, experiencing merely a condensation of volume and consequent hardness, but is in small quantities melted by the oxyhydrogen blowpipe. Its specific gravity is 2.000 in the state of powder, but by ignition it is augmented.

Every analogy leads to the belief that alumina contains a peculiar metal, which may be called *aluminum*. The first evidences obtained of this position are presented in Sir H. Davy's researches. Iron negatively electrified by a very high power being fused in contact with pure alumina, formed a globule whiter than pure iron which effervesced slowly in water, becoming covered with a white powder. The solution of this in muriatic acid, decomposed by an alkali, afforded alumina and oxyde of iron. By passing potassium in vapor through alumina heated to whiteness, the greatest part of the potassium became converted into potassa, which formed a coherent mass with that part of the alumina not decompounded; and in this mass there were numerous gray particles, having the metallic lustre, and which became white when heated in the air, and which slowly effervesced in water. In a similar experiment made by the same illustrious chemist, a strong red heat only being applied to the alumina, a mass was obtained, which took fire spontaneously by exposure to air, and which effervesced violently in water. This mass was probably an alloy of aluminum and potassium. The conversion of potassium into its deutoxyde, dry potassa, by alumina, proves the presence of oxygen in the latter. When regarded as an oxyde, Sir H. Davy estimates its oxygen and basis to be to one another as 15 to 33; or as 10 to 22. The prime equivalent of alumina would thus appear to be $1.0+2.2=3.2$ But Berzelius's analysis of sulphate of alumina seems to indicate 2.136 as the quantity of the earth which combines with five of the acid. Hence aluminum will come to be represented by $2.136+1=1.136$.

mineral strata, which are incombustible, colorless, not convertible into metals by all the ordinary methods of reduction, or

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Alumina which has lost its plasticity by ignition, recovers it by being dissolved in an acid or alkaline menstruum, and then precipitated. In this state it is called a hydrate, for when dried in a steam heat it retains much water; and therefore resembles in composition wavellite, a beautiful mineral, consisting almost entirely of alumina, with about 28 per cent. of water.

Alumina is widely diffused in nature. It is a constituent of every soil, and of almost every rock. It is the basis of porcelain, pottery, bricks, and crucibles. Its affinity for vegetable coloring matter, is made use of in the preparation of lakes, and in the arts of dyeing and calico printing. Native combinations of alumina, constitute the fullers' earth, ochres, boles, pipe-clays, &c.

The salts of alumina have the following general characters:

1. Most of them are very soluble in water, and their solutions have a sweetish acerb taste.

2. Ammonia throws down their earthy base, even though they have been previously acidulated with muriatic acid.

3. At a strong red heat they give out a portion of their acid.

4. Phosphate of ammonia gives a white precipitate.

5. Hydriodate of potassa produces a flocculent precipitate of a white color, passing into a permanent yellow.

6. They are not affected by oxalate of ammonia, tartaric acid, ferroprussiate of potassa, or tincture of galls: by the first two tests they are distinguishable from yttria; and by the last two, from that earth and glucina.

7. If bisulphate of potassa be added to a solution of an aluminous salt moderately concentrated, octahedral crystals of alum will form.

6. SILICA.

(*Selag*, Hebrew.) *Silex.* One of the primitive earths is the principal constituent part of a very great number of the compound earths and stones forming the immense mass of the solid nucleus of the globe. It is the basis of almost all the scintillating stones, such as *flint*, *rock*, *crystal*, *quartz*, *agate*, *calcedony*, *jasper*, *&c.* The sand of rivers, and of the sea-shore, chiefly consist of it. It is deposited in vegetable substances forming petrified wood, &c. It is likewise precipitated from certain springs in a stalactical form. It has been discovered in several waters in a state of solution, and is found in many plants, particularly grasses and equisetums. Professor Davy has proved that it forms a part of the epidermis of these vegetables. It is never met with absolutely pure in nature.

Properties.—Silica, when perfectly pure, exists in the form of a white powder. It is insipid and inodorous. It is rough to the touch, cuts glass, and scratches or wears away metals. Its specific gravity is about 2.66. It is unalterable by the simple combustible bodies. When mixed with water it does not form a cohesive mass. Its moleculæ, when diffused in water, are precipitated with the utmost facility. It is not acted on by any acid, except the fluoric. When in a state of extreme division it is soluble in alkalies; fused with them it forms glass. It melts with the phosphoric and boracic acids. It is unchangeable in the air, and unalterable by oxygen and other gaseous fluids. It has been considered as insoluble in water, but it appears when in a state of extreme division to be soluble in a minute quantity.

Method of obtaining Silex.—Silex may be obtained, tolerably pure, from flints, by the following process: Procure some common gun-flints; expose them in a crucible to a red heat, and then plunge them into cold water; by this treatment they will become brittle, and easily reducible to powder. Mix them, when pulverized, with three or four times their weight of carbonate of potassa, and let the mixture be fused, in a dull red heat, in a silver crucible. We shall thus obtain a compound of alkali and silex, called silicious potassa. Dissolve this compound in water, filter the solution, and add to it dilute sulphuric or muriatic acid. An immediete precipitation now ensues, and as long as this continues, add fresh portions of acid. Let the precipitate subside;

when reduced by scientific refinements, possessing but an evanescent metallic existence, and which either alone, or at

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pour off the fluid that floats above it; and wash the precipitate with hot water till it comes off tasteless. This powder when dry is silica.

In this process the acid added to the solution of flint unites to the potassa, and forms sulphate or muriate of potassa; the silicious earth is therefore precipitated.

It is necessary to add an excess of acid, in order that all the foreign earths which are present may be separated.

If the solution of flints be diluted with a great quantity of water, as for instance, in the proportion of 24 parts to one, and in this state an acid be poured upon it, no perceptible precipitation will ensue; the silex continues suspended in the fluid, and is invisible on account of its transparency; but it may be made to appear by evaporating part of the water.

The solution of flint, on account of its affinity with the carbonic acid, is also in course of time decomposed by mere contact with air.

Another method of obtaining silica exceedingly pure is to separate it from fluoric acid. In consequence of Sir H. Davy's researches on the metallic bases of the alkalies and earths, this earth has been recently regarded as a compound of a peculiar combustible principle with oxygen. If we ignite powdered quartz with three parts of pure potassa in a silver crucible, dissolve the fused compound in water, add to the solution a quantity of acid, equivalent to saturate the alkali, and evaporate to dryness, we shall obtain a fine gritty powder, which being well washed with hot water, and ignited, will leave pure silica. By passing the vapor of potassium over silica in an ignited tube, Sir H. Davy obtained a dark-colored powder, which apparently contained silicon, or silicium, the basis of the earth. Like boron and carbon, it is capable of sustaining a high temperature without suffering any change.

7. GLUCINA.

(From *Glucus*, which signifies sweet, because it gives that taste to the salts in forms.) The name of an earth, for the discovery of which we are indebted to Vauquelin, who found it, in 1795, in the Aigue-marine or beryl, a transparent stone, of a green color, and in the emerald of Peru. It exists combined with silex, alumine, lime, and oxide of iron, in the one; and with the same earths, and oxide of chrome, in the other. It has lately been discovered in the gadolinite by Mr. Ekeberg.

Glucina is white, light, and soft to the touch. It is insipid, and adheres to the tongue; and is infusible by itself in the fire. Its specific gravity is 2.967. It is soluble in alkalies and their carbonates, and in al' the acids except the carbonic and phosphoric, and forms with them saccharine and slightly astringent salts. It is exceedingly soluble in sulphuric acid used to excess. It is fusible with borax, and forms with it a transparent glass. It absorbs one-fourth of its weight of carbonic acid. It decomposes sulphate of alumine. It is not precipitated by the hydro-sulphurets nor by prussiate of potassa, but by all the succinates. Its affinity for the acids is intermediate between magnesia and alumine.

To obtain this earth; reduce some beryl to an impalpable powder, fuse it with three times its weight of potassa, and dissolve the mass in muriatic acid. Separate the silex by evaporation and filtration, and decompose the remaining fluid by adding carbonate of potassa; redissolve the deposite when washed in sulphuric acid, and by mingling this solution with sulphate of potassa, alum will be obtained, which crystalizes.

Then mix the fluid with a solution of carbonate of ammonia, which must be used in excess; filter and boil it, and a white powder will gradually fall down, which is glucine.

8. ZIRCONIA.

Zircon. An earth discovered in the year 1793, by Klaproth of Berlin, in the Zircon or Jargon, a gem first brought from the island of Ceylon, but also found in France, Spain, and other parts of Europe. Its color is either, gray, green-

least when combined with carbonic acid, are insipid and insoluble in water.

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ish, yellowish, reddish-brown, or purple. It has little lustre, and is nearly opaque. Zircon is likewise found in another gem called the hyacinth. This stone is of a yellowish-red color, mixed with brown. It possesses lustre and transparency. To obtain it, the stone should be calcined and thrown into cold water, to render it friable, and then powdered in an agate mortar. Mix the powder with nine parts of pure potassa, and project the mixture by spoonfulls into a red-hot crucible, taking care that each portion is fused before another is added. Keep the whole in fusion, with an increased heat, for an hour and a half. When cold, break the crucible, separate its contents, powder and boil in water, to dissolve the alkali. Wash the insoluble part; dissolve in muriatic acid; heat the solution; that the silex may fall down; and precipitate the zircon by caustic fixed alkali. Or the zircon may be precipitated by carbonate of soda, and the carbonic acid expelled by heat.

New process for preparing pure Zirconia.—Powder the zircons very fine, mix them with two parts of pure potassa, and heat them red hot in a silver crucible, for an hour. Treat the substance obtained with distilled water, pour it on a filter, and wash the insoluble part well; it will be a compound of zirconia, silex, potassa, and oxide of iron. Dissolve it in muriatic acid, and evaporate to dryness, to separate the silex. Redissolve the muriates of zirconia and iron in water; and to separate the zirconia which adheres to the silex, wash it with weak muriatic acid, and add this to the solution. Filter the fluid, and precipitate the zirconia and iron by pure ammonia; wash the precipitates well, and then treat the hydrates with oxalic acid, boiling them well together, that the acid may act on the iron, retaining it in solution, while an insoluble oxalate of zirconia is formed. It is then to be filtered, and the oxalate washed, until no iron can be detected in the water that passes. The earthy oxalate is, when dry, of an opaline color. After being well washed, it is to be decomposed by heat in a platinum crucible.

Thus obtained, the zirconia is perfectly pure, but is not affected by acids. It must be reacted on by potassa as before, and then washed until the alkali is removed. Afterwards dissolve it in muriatic acid, and precipitate by ammonia. The hydrate thrown down, when well washed, is perfectly pure, and easily soluble in acids.

Zircon is a fine white powder, without taste or smell, but somewhat harsh to the touch. It is insoluble in water; yet if slowly dried, it coalesces into a semitransparent yellowish mass, like gum-arabic, which retains one-third its weight of water. It unites with all the acids. It is insoluble in pure alkalies; but the alkaline carbonates dissolve it. Heated with the blowpipe, it does not melt, but emits a yellowish phosphoric light. Heated in a crucible of charcoal, bedded in charcoal powder, placed in a stone crucible, and exposed to a good forge fire for some hours, it undergoes a pasty fusion, which unites its particles into a gray opaque mass, not truly vitreous, but more resembling porcelain. In this state it is sufficiently hard to strike fire with steel, and scratch glass; and is of the specific gravity of 4.3.

There is the same evidence for believing that zirconia is a compound of a metal and oxygen, as that afforded by the action of potassium on the other earths. The alkaline metal, when brought into contact with zirconia ignited to whiteness, is, for the most part, converted into potassa, and dark particles, which, when examined by a magnifying glass, appear metallic in some parts, of a chocolate-brown in others, are found diffused through the potassa and the decompounded earth.

According to Sir H. Davy, 4.66 is the prime equivalent of zirconium on the oxygen scale, and 5.66 that of zirconia.

9. YTTRIA.

This is a new earth discovered in 1794, by Professor Gadolin, in a stone from Ytterby, in Sweden.

It may be obtained most readily by fusing the gadolinate with two parts of caustic potassa, washing the mass with boiling water, and filtering the liquor,

WATER.—(*Aqua.*)

This fluid is so well known, as scarcely to require any definition.

It is transparent, without color, smell, or taste; in a very slight degree compressible; when pure, not liable to spontaneous change; liquid in the common temperature of our atmosphere, assuming the solid form at 32 degrees Fahrenheit, and the gaseous at 212 degrees, but returning unaltered to its liquid state on resuming any degree of heat between those points; capable of dissolving a greater number of natural bodies than any other fluid whatever, and especially those known by the name of the saline; performing the most important functions in the vegetable and animal kingdoms, and entering largely into their composition as a constituent part.

Native water is seldom, if ever, found perfectly pure. The waters that flow within or upon the surface of the earth, con-

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which is of a fine green. This liquor is to be evaporated, till no more oxide of manganese falls down from it in a black powder; after which the liquid is to be saturated with nitric acid. At the same time digest the sediment that was not dissolved, in very dilute nitric acid, which will dissolve the earth with much heat, leaving the silex, and the highly oxided iron, undissolved. Mix the two liquors, evaporate them to dryness, redissolve and filter, which will separate any silex or oxide of iron that may have been left. A few drops of a solution of carbonate of potassa will separate any lime that may be present, and a cautious addition of hydro-sulphuret of potassa will throw down the oxide of manganese that may have been left; but if too much be employed, it will throw down the yttria likewise. Lastly, the yttria is to be precipitated by pure ammonia, well washed and dried.

Yttria is perfectly white, when not contaminated with oxide of manganese, from which it is not easily freed. Its specific gravity is 4.842. It has neither taste nor smell. It is infusible alone; but with borax melts into a transparent glass, or opaque white, if the borax were in excess. It is insoluble in water, and in caustic fixed alkalies; but it dissolves in carbonate of ammonia, though it requires five or six times as much as glucine. It is soluble in most of the acids. The oxalic acid, or oxalate of ammonia, forms precipitates in its solutions perfectly resembling the muriate of silver. Prussiate of potassa, crystalized and redissolved in water, throws it down in white grains; phosphate of soda, in white gelatinous flakes; infusion of galls, in brown flocks.

Some chemists are inclined to consider yttria rather as a metallic than as an earthy substance: their reasons are, its specific gravity, its forming colored salts, and its property of oxygenizing muriatic acid after it has undergone a long calcination.

When yttria is treated with potassium in the same manner as the other earths, similar results are obtained; the potassium becomes potassa, and the earth gains appearances of metallization; so that it is scarcely to be doubted, says Sir H. Davy, that yttria consists of inflammable matter, metallic in its nature, combined with oxygen. The salts of yttria have the following general characters:—

1. Many of them are insoluble in water.
2. Precipitates are occasioned in those which dissolve, by phosphate of soda, carbonate of soda, oxalate of ammonia, tartrate of potassa, and ferroprussiate of potassa.
3. If we except the sweet-tasted soluble sulphate of yttria, the other salts of this earth resemble those with the base of lime in their solubility.

tain various earthy, saline, metallic, vegetable, or animal particles, according to the substances over or through which they pass. Rain and snow waters are much purer than these, although they also contain whatever floats in the air, or has been exhaled along with the watery vapors.

The purity of water may be known by the following marks or properties of pure water:

1. Pure water is lighter than water that is not pure.
2. Pure water is more fluid than water that is not pure.
3. It has no color, smell, or taste.
4. It wets more easily than the waters containing metalic and earthy salts, called hard waters, and feels softer when touched.
5. Soap, or a solution of soap in alcohol, mixes easily and perfectly with it.
6. It is not rendered turbid by adding to it a solution of gold in aqua regia, or a solution of silver, or of lead, or of mercury, in nitric acid, or a solution of acetate of lead in water.

Water was, till modern times, considered as an elementary or simple substance.

Previous to the month of October, 1776, the celebrated Macquer, assisted by Sigaud de la Fond, made an experiment by burning hydrogen gass in a bottle without explosion, and holding a white china saucer over the flame. His intention appears to have been that of ascertaining whether any fuliginous smoke was produced, and he observes, that the saucer remained perfectly clean and white, but was moistened with perceptible drops of a clear fluid, resembling water; and which, in fact, appeared to him and his assistant to be nothing but pure water. He does not say whether any test was applied to ascertain this purity, neither does he make any remark on the fact.

In the month of September, 1777, Bucquet and Lavoisier, not being acquainted with the fact which is incidentally and concisely mentioned by Macquer, made an experiment to discover what is produced by the combustion of hydrogen. They fired five or six pints of hydrogen in an open and wide-mouthed bottle, and instantly poured two ounces of lime water through the flame, agitating the bottle during the time the combustion lasted. The result of this experiment showed, that carbonic acid was not produced.

Before the month of April, 1781, Mr. John Warltire, encouraged by Dr. Priestley, fired a mixture of common air and hydrogen gas in a close copper vessel, and found its weight diminished. Dr. Priestley, likewise, before the same period, fired a like mixture of hydrogen and oxygen gass in a closed glass vessel, Mr. Warltire being present. The inside of the vessel, though clean and dry before, became dewy, and was lined with a sooty substance. These experiments were afterward repeated

by Mr. Cavendish and Dr. Priestley; and it was found, that the diminution of weight did not take place, neither was the sooty matter perceived. These circumstances, therefore, must have arisen from some imperfection in the apparatus or materials with which the former experiments were made.

It was the summer of the year 1781, that Mr. Henry Cavendish was busied in examining what becomes of the air lost by combustion, and made those valuable exoeriments which were read before the Royal Society on the 15th of January, 1784. He burned 500,000 grain measures of hydrogen gas, with about two and a half times the quantity of common air, and by causing the burned air to pass through a glass tube 8 feet in length, 135 grains of pure water were condensed. He also exploded a mixture of 19,500 grain measures of oxygen gass, and 37,000 of hydrogen, in a close vessel. The condensed liquor was found to contain a small portion of nitric acid, when the mixture of the air was such, that the burned air still contained a considerable portion of oxygen. In this case it may be presumed, that some of the oxygen combines with a portion of nitrogen present.

In the mean time, Lavoisier continued his researches, and during the winter of 1781–1782, together with Gingembre, he filled a bottle of six pints with hydrogen, which being fired, and two ounces of lime-water poured in, was instantly stopped with a cork, through which a flexible tube communicating with a vessel of oxygen was passed. The inflammation ceased, except at the orifice of the tube, through which the oxygen was pressed, where a beautiful flame appeared. The combustion continued a considerable time, during which the lime-water was agitated in the bottle. Neither this, nor the same experiment repeated with pure water, and with a weak solution of alkali instead of lime-water, afforded the information sought after, for these substances were not at all altered.

The inference of Mr. Warltire, respecting the moisture on the inside of the glass in which Dr. Priestley first fired hydrogen and common air, was, that these airs, by combustion, deposited the moisture they contained. Mr. Watt, however, inferred from these experiments, that water is a compound of the burned airs, which have given out their latent heat by combustion; and communicated his sentiments to Dr. Priestley, in a letter dated April 26, 1783.

It does not appear, that the composition of water was known or admitted in France till the summer of 1783, when Lavoisier and De la Place, on the 24th of June, repeated the experiment of burning hydrogen and oxygen in a glass vessel over mercury, in a still greater quantity than had been burned by Mr. Cavendish. The result was nearly five gros of pure water.

Monge made a similar experiment at Paris, nearly at the same time, or perhaps before.

This assiduous and accurate philosopher then proceeded, in conjunction with Meusnier, to pass the steam of water through a red hot iron tube, and found that the iron was oxydized, and hydrogen disengaged ; and the steam of water being passed over a variety of other combustible or oxidable substances produced similar results, the water disappearing and hydrogen being disengaged. These capital experiments were accounted for by Lavoisier, by supposing the water to be decomposed into its component parts, oxygen and hydrogen, the former of which unites with the ignited substance, while the latter is disengaged.

The grand experiment of the composition of water by Fourcroy, Vauquelin, and Seguin, was begun on Wednesday, May 13, 1790, and was finished on Friday, the 22d of the same month. The combustion was kept up 185 hours with little interruption, during which time the machine was not quitted for a moment. The experimenters alternately refreshed themselves when fatigued, by lying for a few hours on mattresses in the laboratory.

To obtain the hydrogen, 1. Zinc was melted and rubbed into a powder in a very hot mortar. 2. This metal was dissolved in concentrated sulphuric acid, diluted with seven parts of water. The air procured was made to pass through caustic alkali. To obtain the oxygen, two pounds and a half of crystallized hyperoxmuriate of potassa were distilled, and the air was transferred through caustic alkali.

The volume of hydrogen employed was 25963.568 cubic inches, and the weight was 1039.358 grains.

The volume of oxygen was 12570.942, and the weight was 6209.869 grains.

The total weight of both elastic fluids was 7249.227.

The weight of water obtained was 7244 grains, or 12 ounces 4 gros 45 grains.

The weight of water which should have been obtained was 12 ounces 4 gros 49.227 grains. The deficit was 4.227 grains.

The quantity of azotic air before the experiment was 415.256 cubic inches, and at the close of it 467. The excess after the experiment was consequently 51.744 cubic inches. This augmentation is to be attributed, the academicians think, to the small quantity of atmospheric air in the cylinders of the gasometers at the time the other airs were introduced. These additional 51 cubic inches could not arise from the hydrogen, for experiment showed that it contained no azotic air. Some addition of this last fluid, the experimenters think, cannot be avoided, on account of the construction of the machine.

The water being examined, was found to be as pure as distilled water. Its specific gravity to distilled water was as 18671 : 18670.

The decomposition of water is most elegantly effected by electricity.

The composition of water is best demonstrated by exploding two volumes of hydrogen and one of oxygen in the eudiometer. They disappear totally, and pure water results. A cubic inch of this liquid at 60 degrees weighs 252.52 grains, consisting of

28.06 grains hydrogen, and
224.46 oxygen.

The bulk of the former gas is 1325 cubic inches.
That of the latter is 662

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Hence there is a condensation of nearly two thousand volumes into one; and one volume of water contains 662 volumes of oxygen. The prime equivalent of water is 1.125 : composed of a prime of oxygen = 1.0+a prime of hydrogen = 0.125; or 9 parts by weight of water, consisting of 8 oxygen+1 hydrogen.

The simple waters are the following:

1. *Distilled Water.*

This is the lightest of all others, containing neither solid nor gaseous substances in solution, is perfectly void of taste and smell, colorless and beautifully transparent, has a soft feel, and wets the fingers more readily than any other. It mixes uniformly with soap into a smooth opaline mixture, but may be added to a solution of soap in spirit of wine without injuring its transparency. The clearness of distilled water is not impaired by the most delicate chemical reagents, such as lime-water, a solution of barytes in any acid, nitrated silver, or acid of sugar. When evaporated in a silver vessel it leaves no residuum; if preserved from access of foreign matter floating in the air, it may be kept for ages unaltered in vessels upon which it has no action, as it does not possess within itself the power of decomposition. As it freezes exactly at 32 degrees of Fahrenheit, and boils at 212 degrees, under the atmospherical pressure of 29.8 inches, these points are made use of as the standard ones for thermometrical division; and its specific weight being always the same under the mean pressure and temperature, it is employed for the comparative standard of specific gravity.

Pure distilled water can only be procured from water which contains no volatile matters that will rise in distillation, and continue still in union with the vapor when condensed. Many substances are volatile during distillation, but most of the gas-

es, such as common air, carbonic acid, and the like, are incapable of uniting with water at a high temperature: other bodies, however, such as vegetable essential oil, and, in general, much of that which gives the peculiar odor to vegetable and animal matter, will remain in water after distillation. So the steam of many animal and vegetable decoctions has a certain flavor which distinguishes it from pure water; and the aqueous exhalation from living bodies, which is a kind of distillation, has a similar impregnation.

To obtain distilled water perfectly pure, much stress was laid by former chemists on repeating the process a great number of times; but it was found by Lavoisier, that rain water once distilled, rejecting the first and last products, was as pure a water as could be procured by any subsequent distillations.

Distilled water appears to possess a higher power than any other as a resolvent of all animal and vegetable matter, and these it holds in solution as little as possible altered from the state in which they existed in the body that yielded them. Hence the great practical utility of that kind of chemical analysis which presents the proximate constituent parts of these bodies, and which is effected particularly by the assistance of pure water. On the other hand, a saline, earthy, or otherwise impure water, will alter the texture of some of the parts, impair their solubility, produce material changes in the coloring matter, and become a less accurate analyzer on account of the admixture of foreign contents.

Distilled water is seldom employed to any extent in the preparation of food, or in manufactures, on account of the trouble of procuring it in large quantities; but for preparing a great number of medicines, and in almost every one of the nicer chemical processes that are carried on in the liquid way, this water is an essential requisite. The only cases in which it has been used largely as an article of drink, have been in those important trials made of the practicability of procuring it by condensing the steam of sea water, by means of a simple apparatus adapted to a ship's boiler: and these have fully shown the ease with which a large quantity of fresh water, of the purest kind, may be had at sea, at a moderate expense, whereby one of the most distressing of all wants may be relieved. There are one or two circumstances which seem to show that water, when not already loaded with foreign matter, may become a solvent for concretions in urinary passages. At least, we know that very material advantage has been derived in these cases from very pure natural springs, and hence a course of distilled water has been recommended as a fair subject of experiment.

2. *Rain Water*,

The next in purity to distilled water, is that which has undergone a natural distillation from the earth, and is condensed in the form of rain. This is a water so nearly approaching to absolute purity as probably to be equal to distilled water for every purpose except in the nicer chemical experiments. The foreign contents of rain water appear to vary according to the state of the air through which it falls. The heterogeneous atmosphere of a smoky town will give some impregnation to rain as it passes through; and this, though it may not be at once perceptible on chemical examination, will yet render it liable to spontaneous change; and hence, rain water, if long kept, especially in hot climates, acquires a strong smell, becomes full of animalcula, and in some degree putrid. According to Margraaff, the constant foreign contents of rain water appear to be some traces of the muriatic and nitric acids; but as this water is always very soft, it is admirably adapted for dissolving soap, or for the solution of alimentary or coloring matter, and it is accordingly used largely for these purposes. The specific gravity of rain water is so nearly the same as that of distilled water, that it requires the most delicate instruments to ascertain the difference. Rain that falls in towns acquires a small quantity of lime and calcareous matter, from the mortar and plaster of the houses.

3. *Ice and Snow Water.*

This equals rain water in purity, and when fresh melted contains no air, which is expelled during freezing. In cold climates and in high latitudes, thawed snow forms the constant drink of the inhabitants during winter; and the vast masses of ice which float on the polar seas afford an abundant supply to the mariner. It is well known, that in a weak brine, exposed to a moderate freezing cold, it is only the watery part that congeals, leaving the unfrozen liquor proportionably stronger of the salt. The same happens with a dilute solution of vegetable acids, with fermented liquors, and the like; and advantage is taken of this property to reduce the saline part to a more concentrated form. Snow water has long lain under the imputation of occasioning those strumous swellings in the neck which deform the inhabitants of many of the Alpine valleys; but this opinion is not supported by any well authenticated, indisputable facts, and is rendered still more improbable, if not entirely overturned, by the frequency of the disease in Sumatra, where ice and snow are never seen, and its being quite unknown in Chili and Thibet, though the rivers of these countries are chiefly supplied by the melting of the snow, with which the mountains are covered.

4. *Spring Water.*

Under this comprehensive class are included all waters that spring from some depth beneath the soil, and are used at the fountain head, or at least before they have run any considerable distance exposed to the air. It is obvious, that spring water will be as various in its contents as the substances that compose the soil through which it flows. When the ingredients are not such as to give any peculiar medical or sensible properties, and the water is used for common purposes, it is distinguished as a hard or soft spring, sweet or brackish, clear or turbid, and the like. Ordinary springs insensibly pass into mineral springs, as their foreign contents become more notable and uncommon; though sometimes waters have acquired great medical reputation from mere purity.

By far the greater number of springs are cold; but as they take their origin at some depth from the surface, and below the influence of the external atmosphere, their temperature is in general pretty uniform during every vicissitude of season, and always several degrees higher than the freezing point. Others, again, arise constantly hot, or with a temperature always exceeding the summer heat; and the warmth possessed by the water is entirely independent of that of the atmosphere, and varies little, winter or summer.

One of the principal inconveniencies in almost every spring water, is its hardness, owing to the presence of earthy salts, which, in by far the greater number of cases, are only the insipid substances, chalk and selenite, which do not impair the taste of the water; while the air which it contains, and its grateful coolness, render it a most agreeable, and generally a perfectly innocent drink; though sometimes in weak stomachs it is apt to occasion an uneasy sense of weight in that organ, followed by a degree of dispepsia. The quantity of earthy salts varies considerably; but in general it appears that five grains of these to a pint will constitute a hard water, unfit for washing with soap, and for many other purposes of household use or manufactures. The water of deep wells is always, *ceteris paribus*, much harder than that of springs which overflow their channel; for much agitation and exposure to air produce a gradual deposition of the calcareous earth; and hence spring water often encrusts to a considerable thickness the inside of any kind of tube through which it flows as it arises from the earth. The specific gravity of these waters is also in general greater than that of any other kind of water, that of the sea excepted. Springs that overflow their channel, and form to themselves a limited bed, pass insensibly into the state of stream or river water, and become thereby altered in some of their chemical properties.

5. *River Water.*

This is in general much softer, and more free from earthy salts than the last, but contains less air of any kind; for by the agitation of a long current, and in most cases a great increase of temperature, it loses common air and carbonic acid, and, with this last, much of the lime which it held in solution. The specific gravity thereby becomes less, the taste not so harsh, but less fresh and agreeable, and out of a hard spring is often made a stream of sufficient purity for most of the purposes where a soft water is required. Some streams, however, that arise from a clean silicious rock, and flow in a sandy or stony bed, are from the outset remarkably pure. Such are the mountain lakes and rivulets in the rocky districts of Wales, the source of the beautiful waters of the Dee, and numberless other rivers that flow through the hollow of every valley. Switzerland has long been celebrated for the purity and excellence of its waters, which pour in copious streams from the mountains, and give rise to some of the finest rivers in Europe. Some of them never freeze in the severest winter, the cause of which is probably, as Haller conjectures, that they spring at once out of a subterraneous reservoir so deep as to be out of the reach of frost; and during their short course, when exposed to day, they have not time to be cooled down from 53 deg., their original temperature, to below the freezing point.

Some river waters, however, that do not take their rise from a rocky soil, and are indeed at first considerably charged with foreign matter, during a long course, even over a rich cultivated plain, become remarkably pure as to saline contents, but often fouled with mud, and vegetable or animal exuviæ, which are rather suspended than held in true solution. Such is that of the Thames, which, taken up at London at low water, is a very soft and good water, and, after rest and filtration, it holds but a very small portion of any thing that could prove noxious or impede any manufacture. It is also excellently fitted for sea-store; but it here undergoes a remarkable spontaneous change. No water carried to sea becomes putrid sooner than that of the Thames. When a cask is opened after being kept a month or two, a quantity of inflammable air escapes, and the water is so black and offensive as scarcely to be borne. Upon racking it off, however, into large earthen vessels (oil jars are commonly used for the purpose), and exposing it to the air, it gradually deposites a quantity of black slimy mud, becomes clear as crystal, and remarkably sweet and palatable. The Seine has as high a reputation in France, and appears from accurate experiments to be a river of great purity. It might be expected that a river which has passed by a large town, and received all its impurities, and been used by numerous dyers,

tanners, hatters, and the like, that crowd to its banks for the convenience of plenty of water, should thereby acquire such a foulness as to be very perceptible to chemical examination for a considerable distance below the town; but it appears, from the most accurate examination, that where the stream is at all considerable, these kinds of impurity have but little influence in permanently altering the quality of the water, especially as they are for the most part only suspended, and not truly dissolved; and, therefore, mere rest, and especially filtration, will restore the water to its original purity. Probably, therefore, the most accurate chemist would find it difficult to distinguish water taken up at London from that procured at Hampton Court, after each has been purified by simple filtration.

6. *Stagnated Waters.*

The waters that present the greatest impurities to the senses, are those of stagnant pools, and low marshy countries. They are filled with the remains of animal and vegetable matter undergoing decomposition, and, during that process, becoming in part soluble in water, thereby affording a rich nutriment to the succession of living plants and insects which is supplying the place of those that perish. From the want of sufficient agitation in these waters, vegetation goes on undisturbed, and the surface becomes covered with conferva and other aquatic plants; and as these standing waters are in general shallow, they receive the full influence of the sun, which further promotes all the changes that are going on within them. The taste is generally vapid, and destitute of that freshness and agreeable coolness which distinguish spring water. However, it should be remarked, that stagnant waters are generally soft, and many of the impurities are only suspended, and therefore separable by filtration; and perhaps the unpalatableness of this drink has caused it to be in worse credit than it deserves, on the score of salubrity. The decidedly noxious effects produced by the air of marshes and stagnant pools, have been often supposed to extend to the internal use of these waters; and often, especially in hot climates, a residence near these places has been as much condemned on the one account as on the other; and, in like manner, an improvement in health has been as much attributed to a change of water as of air.

2d. THE ACTIVE:

OR, FIRE AND AIR, AND THEIR CONSTITUENTS.

FIRE.

Ignis. A very simple and active element, the principal agent in nature to balance the power and natural effect of attraction. The most useful acceptation of the word fire comprehends *heat* and *light.* There have been several theories proposed respecting fire, but no one as yet is fully established.*

CALORIC.

(*Caloricum;* from *calor*, heat.) Heat; Igneous fluid.

Heat and cold are perceptions of which we acquire the ideas from the senses; they indicate only a certain state in which we find ourselves, independent of any exterior object. But as these sensations are for the most part produced by bodies around us, we consider them as causes, and judging by appearances, we apply the terms *hot*, or *cold*, to the substances themselves; calling those bodies *hot*, which produce in us the sensation of heat, and those *cold*, which communicate the contrary sensation.

This ambiguity, though of little consequence in the common affairs of human life, has led unavoidably to confusion and perplexity in philosophical discussions. It was to prevent this, that the framers of the new nomenclature adopted the word *caloric*, which denotes that which produces the sensation of heat.

Theories of Heat.

Two opinions have long divided the philosophical world concerning the nature of heat.

1. The one is; that the cause which produces the sensation of heat, is a real, or distinct substance, universally pervading nature, penetrating the particles or pores of all bodies, with more or less facility, and in different quantities.

This substance, if applied to our system in a greater proportion than it already contains, warms it, as we call it, or produces the sensation of heat; and hence it has been called *caloric*, or *calorific*.

2. The other theory concerning heat is; that the cause which produces that sensation is *not* a separate or self-existing substance; but that it is merely like gravity, a property of matter; and that it consists in a specific or *peculiar motion*, or *vibration* of the particles of bodies.

The arguments in favor of the first theory have been principally deduced from the evolution and absorption of heat during chemical combinations; those of the latter are chiefly founded on the production of heat by friction. For it has been observed, that whatever is capable of producing motion in the particles of any mass of matter, excites heat. Count Rumford and Professor Davy have paid uncommon attention to this fact, and proved, that heat continues to be evolved from a body subjected to friction, so long as it is applied, and the texture or form of the body not altered.

All the effects of heat according to this theory, depend therefore entirely upon the vibratory motion of the particles of bodies. According as this is more or less intense, a higher or lower temperature is produced; and as it predominates over, is nearly equal or inferior to the attraction of cohesion, bodies exist in the gaseous, fluid, or solid state.

Different bodies are susceptible of it in different degrees, and receive and communicate it with different celerity. From the generation, communication, and attraction of this repulsive motion, under these laws, all the phenomena ascribed to heat are explicable.

Each of these theories has been supported by the most able philosophers, and given occasion to the most important disputes in which chemists have been engaged: which has contributed in a very particular manner to the ad-

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* See *Caloric* and *Light*.

vancement of the science. The obscurity of the subject, however, is such, that both parties have been able to advance most plausible arguments.

Setting aside all inquiries concerning the merits of these different doctrines, we shall confine ourselves to the general effects which heat produces on different bodies. For the phenomena which heat presents, and their relation to each other, may be investigated with sufficient precision, though the materiality, or immateriality of it, may remain unknown to us.

Nature of Heat.

Those who consider heat as matter, assert that caloric exists in two states, namely, in combination, or at liberty.

In the first state it is not sensible to our organs, nor indicated by the thermometer ; it forms a constituent part of the body ; but it may be brought back to the state of sensible heat. In this state it affects animals with the sensation of heat. It therefore has been called sensible or free heat, or fire ; and is synonymous with uncombined caloric, thermometrical caloric, caloric of temperature, interposed caloric, &c. expressions now pretty generally superseded.

From the diversity of opinions among chemists respecting the nature of caloric, several other expressions have been introduced, which it is proper to notice. For instance, by *specific heat* is understood, the relative quantities of caloric contained in equal weights of different bodies at the same temperature. *Latent heat* is the expression used to denote that quantity of caloric which a body absorbs when changing its form. It is, however, more properly called *caloric of fluidity.* The disposition, or property, by which different bodies contain certain quantities of caloric, at any temperature, is termed their *capacity for heat.* By the expression of *absolute heat,* is understood the whole quantity of caloric which any body contains.

Methods of exciting and collecting Heat.

Of the different methods of exciting heat, the following are the most usual :

1. *Percussion or Collision.* This method of producing heat is the simplest, and therefore it is generally made use of in the common purposes of life for obtaining fire.

When a piece of hardened steel is struck with a flint, some particles of the metal are scraped away from the mass, and so violent is the heat which follows the stroke, that it melts and vitrifies them. If the fragments of steel are caught upon paper, and viewed with a microscope, most of them will be found perfect spherules, and very highly polished. Their sphericity demonstrates that they have been in a fluid state, and the polish upon their surface, shows them to be vitrified.

No heat, however, has been observed to follow the percussion of liquids, nor of the softer kind of bodies which yield to a slight impulse.

2. *Friction.* Heat may likewise be excited by mere friction. This practice is still retained in some parts of the world. The natives of New Holland are said to produce fire in this manner, with great facility, and spread it in a wonderful manner. For that purpose they take two pices of dry wood ; one is a stick, about eight or nine inches long, and the other piece is flat ; the stick they bring to an obtuse point at one end, and pressing it upon the other piece, they turn it very nimbly, by holding it between both hands, as we do a chocolate-mill, often shifting their hands up, and then moving down upon it, in order to increase the pressure as much as possible. By this method they get fire in a few minutes, and from the smallest spark they increase it with great speed and dexterity.

If the irons at the axis of a coach-wheel are applied to each other, without the interposition of some unctuous matter to keep them from immediate contact, they will become so hot when the carriage runs swiftly along, as to set the wood on fire ; and the fore-wheels, being smallest, and making most revolutions in a given time, will be most in danger.

The same will happen to mill-work, or to any other machinery.

It is no uncommon practice in this country, for blacksmiths to use a plate of iron as an extemporaneous substitute for a tinder-box ; for it may be ham-

mered on an anvil till it becomes red-hot, and will fire a brimstone match. A strong man who strikes quick, and keeps turning the iron so that both sides may be equally exposed to the force of the hammer, will perform this in less time than would be expected.

If, in the coldest season, one dense iron plate be laid on another, and pressed together by a weight, and then rubbed upon each other by reciprocal motions, they will gradually grow so hot as, in a short time, to emit sparks, and at last become ignited.

It is not necessary that the substances should be very hard; a cord rubbed backwards and forwards swiftly against a post or a tree will take fire.

Count Rumford and Professor Pictet have made some very ingenious and valuable experiments concerning the heat evolved by friction.

3. *Chemical Action.* To this belongs the heat produced by combustion. There are, besides this, many chemical processes wherein rapid chemical action takes place, accompanied with a developement of heat, or fire, and flame.

4. *Solar heat.* It is well known that the solar rays, when collected by a mirror, or lens, into a focus, produce the most astonishing effects.

Dr. Herschel has discovered that there are rays emitted from the sun, which have not the power of illuminating or producing vision: and that these are the rays which produce the heat of the solar light.

Consequently, heat is emitted from the sun in rays, but these rays are not the same with the rays of light.

5. *The Electric Spark, and Galvanism.* The effects of electricity are too well known in this point of view to need any description.

Galvanism has of late become a powerful instrument for the purpose of exciting heat. Not only easily inflammable substances, such as phosphorus, sulphur, &c. have been fired, but likewise, gold, silver, copper, tin, and the rest of the metals, have been burnt by means of galvanism.

General Effects of Heat.

The first and most obvious effect which heat produces on bodies, is its expansive property. Experience has taught us that, at all times, when bodies become hot, they increase in bulk. The bodies experience a dilatation which is greater in proportion to the accumulation of caloric, or in other words, to the intensity of the heat. This is a general law, which holds good as long as the bodies have suffered no change either in their combination or in the quantity of their chemical principles.

This power, which heat possesses, consists, therefore, in a constant tendency to separate the particles of bodies. Hence philosophers consider heat as the *repulsive power* which acts upon all bodies whatever, and which is in constant opposition to the power of attraction.

The phenomena which result from these mutual actions, seem, as it were, the secret springs of nature. Heat, however, does not expand all bodies equally, and we are still ignorant of the laws which it follows.

1. *Expansion of Fluid Bodies.* Take a glass globe, with a long slender neck (called a bold heat); fill it up to the neck with water, ardent spirit, or any other fluid which may be colored with red or black ink, in order to be more visible, and then immerse the globe of the instrument in a vessel of hot water; the included fluid will instantly begin to mount into the neck. If it be taken out of the water and brought near the fire, it will ascend more and more, in proportion as it becomes heated; but, upon removing it from the source of heat, it will sink again: a clear proof that caloric dilates it, so as to make it occupy more space when hot than when cold. These experiments may, therefore, serve as a demonstration that heat expands *fluid* bodies.

2. *Expansion of Aeriform Bodies.* Take a bladder partly filled with air, the neck of which is closely tied, so as to prevent the enclosed air from escaping, and let it be held near a fire. The air will soon begin to occupy more space, and the bladder will become gradually distended; on continuing the expansion of the air, by increasing the heat, the bladder will burst with a loud report.

3. *Expansion of Solid Bodies.* If we take a bar of iron, six inches long, and put it into fire till it becomes red-hot; and then measure it in this state accu-

rately, it will be found 1-20th of an inch longer than it was before; that is, about 120th part of the whole. That the metal is proportionably expanded in breadth, will be seen by trying to pass it through an aperture which is fitted exactly when cold, but which will not admit it when red-hot. The bar is, therefore, increased in length and diameter.

To discover the minutest changes of expansion by heat, and the relative proportions thereof, instruments have been contrived, called *Pyrometers*, the sensibility of which is so delicate as to show an expansion of 1-100,000th of an inch.

It is owing to this expansion of metals, that the motion of time-pieces is rendered erroneous; but the ingenuity of artists has discovered methods of obviating this inaccuracy, by employing the greater expansion of one metal, to counteract the expansion of another; this is effected in what is called the grid-iron pendulum. Upon the same principle, a particular construction of watches has been contrived.

The expansion of metals is likewise one of the principal reasons that clocks and watches vary in winter and summer, when worn in the pocket, r exposed to the open air, or when carried into a hotter or a colder climate. For the number of the vibrations of the pendulum is always in the sub-duplicate ratio of its length, and as the length is changed by heat and cold, the times of vibration will also be changed. The quantity of alteration, when considered in a single vibration, is exceedingly small, but when they are often repeated, it will be very sensible. An alteration of one-thousandth part in the time of a single vibration of a pendulum which beats seconds, will make a change of eighty-six whole vibrations in twenty-four hours.

As different metals expand differently with the same degree of heat; those musical instruments, whose parts are to maintain a constant true proportion, should never be strung with different metals. It is on this account that harpsichords, &c. are out of tune by a change of temperature.

Bodies which are brittle, or which want flexibility, crack or break, if suddenly heated. This likewise depends upon the expansive force of heat, stretching the surface to which it is applied, while the other parts, not being equally heated, do not expand in the same ratio, and are therefore torn asunder or break. Hence thin vessels stand heat better than thick ones. The same holds, when they are suddenly cooled.

Measurement of Heat.

Upon the expansive property of heat, which we have considered before, is founded its artificial measurement. Various means have been employed to assist the imperfection of our sensations in judging of the different degrees of heat; for our feelings, unaided, afford but very inaccurate information concerning this matter; they indicate the presence of *heat*, only when the bodies presented to them are *hotter* than the actual temperature of our organs of feeling. When these bodies are precisely of the same temperature with our body, which we make the standard of comparison, we then are not sensible of the presence of heat in them. When their temperature is less than that of our bodies, their contact gives us what is called the sensation of cold.

The effects of heat upon material bodies in general, which are easily visible to us, afford more precise and determinate indications of the intensity, than can be derived from our feelings alone. The ingenuity of the philosopher and artist has therefore furnished us with instruments of measuring the relative heat or temperature of bodies. These instruments are called *Thermometers* and *Pyrometers*. By these, all degrees are measurable, from the slightest to that of the most intense heat.

Exceptions to the Expansion by Heat.

Philosophers have noticed a few exceptions to the law of heat expanding bodies. For instance; water, when cooled down within about 7 deg. of the freezing point, instead of contracting on the farther deprivation of heat, actually expands.

Another seeming exception is manifested in alumine, or clay; others occur in the case of cast-iron, and a few other metals. Alumine contracts on being

heated, and cast-iron, bismuth &c. when fully fused, are more dense than when solid; for, as soon as they become so, they decrease in density, they expand in the act of cooling, and hence the sharpness of figures upon iron which has been cast in moulds, compared to that of many other metals.

Some philosophers have persuaded themselves that these exceptions are only *apparent*, but not really true. They say, when water freezes, it assumes a crystaline form, the crystals cross each other and cause numerous vacuities, and thus the ice occupies more space. The same is the case with fused iron, bismuth and antimony. The contraction of clay is considered owing to the loss of water, of which it loses a part at every increased degree of temperature hitherto tried; there is, therefore, a loss of matter; and a reduction of volume must follow: but others assert, that this only happens to a certain extent.

Mr. Tilloch has published a brief examination of the received doctrines respecting heat and caloric, in which these truths are more fully considered, together with many other interesting facts relative to the received notions of heat.

Equal Distribution of Heat.

If a number of bodies of different temperatures are placed in contact with each other, they will all at a certain time acquire a temperature, which is intermediate; the caloric of the hottest body will diffuse itself among those which are heated in a less degree, till they have all acquired a certain mean temperature. Thus, if a bar of iron, which has been made red-hot, be kept in the open air, it does not retain the heat which it had received, but becomes gradually colder and colder, till it arrives at the temperature of the bodies in its neighborhood. On the other hand, if we cool down the iron bar by keeping it for some time covered with snow, and then carry it into a warm room, it does not retain its low temperature, but becomes gradually hotter, till it acquires the temperature of the room. It is therefore obvious, that in the one instance the temperature is lowered, and in the other it is raised.

These changes of temperature occupy a longer or a shorter time, according to the nature of the body, but they always take place at last. This law itself is, indeed, familiar to every one: when we wish to heat a body, we carry it toward the fire: when we wish to cool it, we surround it by cold bodies.

Propagation of Heat.

We have seen, that when bodies of higher temperature than others are brought into contact with each other, the heat is propagated from the first to the second, or the colder body deprives the warmer of its excess of heat. We shall now see that some bodies do so much more quickly than others. Through some bodies caloric passes with undiminished velocity, through others its passage is prodigiously retarded.

This disposition of bodies, of admitting, under equal circumstances, the refrigeration of a heated body within a shorter or a longer time, is called *the power of conducting heat;* and a body is said to be a *better* or *worse conductor of heat*, as it allows the refrigeration to go on quicker or slower. Those bodies, therefore, which possess the property of letting heat pass with facility, are called *good conductors*, those through which it passes with difficulty are called *bad conductors*, and those through which it is supposed not to pass at all, are called *non-conductors;* thus we say, in common language, some bodies are *warm*, or capable of preserving warmth, and from this arises the great difference in the sensation excited by different bodies, when applied at the same temperature to our organs of feeling. Hence, if we immerse our hand in mercury, we feel a greater sensation of cold than when we immerse it in water, and a piece of metal appears to be much colder than a piece of wood, though their temperatures, when examined by means of the thermometer, are precisely the same.

It is probable that all solids conduct heat in some degree, though they differ very much in their conducting power. Metals are the best conductors of heat; but the conducting powers of these substances are by no means equal. Stones seem to be the next best conductors. Glass conducts heat very slowly;

wood and charcoal still slower; and feathers, silk, wool, and hair are still worse conductors than any of the substances yet mentioned.

The best conductors of electricity and galvanism are also the best conductors of heat.

Experiment.—Take a number of straight wires, of equal diameters and lengths, but of different metals; for instance, gold silver, copper, iron, &c.; cover each of them with a thin coat of wax, or tallow, and plunge their extremities into water kept boiling, or into melted lead. The melting of the coat of wax will show that caloric is more quickly transmitted through some metals than others.

It is on this account also, that the end of a glass rod may be kept red-hot for a long time, or even melted, without any inconvenience to the hand which holds the other extremity; though a similar metallic rod, heated in the same manner, would very soon become too hot to be held.

Liquid and Aeriform Bodies convey Heat by an actual Change in the Situation of their Particles.

Count Rumford was the first who proved that fluids in general, and aeriform bodies, convey heat on a different principle from that observed in the solids. This opinion is pretty generally admitted, though various ingenious experiments have been made, by different philosophers, to prove the contrary. In water, for instance, the count has proved that caloric is propagated principally in consequence of the motion which is occasioned in the particles of that fluid.

All fluids are considered by him, strictly speaking, in a simliar respect as *non-conductors* of caloric. They can receive it, indeed, from other substances, and can give it to other substances, but no particle can either receive it from or give it to another particle of the same kind. Before a fluid, therefore, can be heated or cooled, every particle must go individually to the substance from which it receives or to which it gives out caloric. Heat being, therefore, only propagated in fluids, in consequence of the internal motion of their particles, which transport the heat; the more rapid these motions are, the more rapid is the communication of heat. The cause of these motions is the change in the specific gravity of the fluid, occasioned by the change of temperature, and the rapidity is in proportion to the change of the specific gravity of the liquid by any given change of temperature. The following experiment may serve to illustrate this theory:

Take a thin glass tube, eight or ten inches long, and about an inch in diameter. Pour into the bottom part, for about the depth of one inch, a little water colored with Brazil-wood, or litmus, and then fill up the tube with common water, extremely gently, so as to keep the two *strata* quite distinct from each other. Having done this, heat the bottom part of the tube over a lamp; the colored infusion will then ascend, and gradually tinge the whole fluid; on the contrary, if the heat be applied above, the water in the upper part of the tube may be made to boil, but the coloring matter will remain at the bottom undisturbed. The heat cannot act downwards to make it ascend.

By thus being able to make the upper part of a fluid boil without heating the bottom part, water may be kept boiling for a considerable time in a glass tube over ice, without melting it.

Other experiments, illustrating the same principle, may be found in Count Rumford's excellent essays, especially in essay the 7th; 1797,

To this indefatigable philosopher we are wholly indebted for the above facts: he was the first who taught us that air and water were nearly non-conductors. The results of his experiments, which are contained in the above essay, are highly interesting; they also show that the conducting power of fluids is impaired by the admixture of fibrous and glutinous matter.

Count Rumford proved that ice melted more than 80 times slower, when boiling hot water stood on its surface, than when the ice was placed to swim on the surface of the hot water. Other experiments showed that water, only eight degrees of Fahrenheit above the freezing point, or at the temperature of forty degrees, melts as much ice, in any given time, as an equal volume of that fluid at any higher temperature, provided the water stands on the surface

of the ice. Water, at the temperature of 41 deg., is found to melt more ice, when standing on its surface, than boiling water. It appears, however, that liquids are not, as he supposes, complete non-conductors of caloric: because, if heat be applied at top, it is capable of making its way downwards, through water, for example, though very imperfectly and slowly.

It becomes farther evident, from the Count's ingenious experiments, that of the different substances used in clothing, hares' fur and eider-down, are the warmest; next to these, beavers' fur, raw silk, sheep's wool, cotton wool, and lastly, lint, or the scrapings of fine linen. In fur, the air interposed among its particles is so engaged as not to be driven away by the heat communicated thereto by the animal body; not being easily displaced, it becomes a barrier to defend the animal body from the external cold. Hence it is obvious that those skins are warmest which have the finest, longest, and thickest fur; and that the furs of the beaver, otter, and other like quadrupeds, which live much in the water, and the feathers of water-fowl, are capable of confining the heat of those animals in winter, notwithstanding the coldness of the water which they frequent. Bears, and various other animals, inhabitants of cold climates, which do not often take the water, have their fur much thicker on their backs than on their bellies.

The snow which covers the surface of the earth in winter, in high latitudes, is doubtless designed as a garment to defend it against the piercing winds from the polar regions, which prevail during the cold season.

Without dwelling farther upon the philosophy of this truth, we must briefly remark that the happy application of this law, satisfactorily elucidates some of the most interesting facts of the economy of nature.

Theory of Caloric of Fluidity, or Latent Heat.

There are some bodies which, when submitted to the action of caloric, dilate to such a degree, and the power of aggregation subsisting among their particles is so much destroyed and removed to such a distance by the interposition of caloric, that they slide over each other in every direction, and therefore appear in a fluid state. This phenomena is called *fusion*. Bodies thus rendered fluid by means of caloric, are said to be *fused*, or *melted;* and those that are subject to it are called *fusible*.

The greater number of solid bodies may, by the application of heat, be converted into fluids. Thus metals may be fused; sulphur, resin, phosphorus, may be melted; ice may be converted into water, &c.

Those bodies which cannot be rendered fluid by any degree of heat hitherto known, are called *infusible*.

If the effects of heat, under certain circumstances, be carried still farther than is necessary to render bodies fluid, vaporization begins; the bodies then become converted into the vaporous or *gaseous state*. Vaporization, however, does not always require a previous fusion. Some bodies are capable of being converted into the vaporous state, without previously becoming fluid, and others cannot be volatilized at any temperature hitherto known: the latter are termed fixed.

Fluidity is, therefore, by no means essential to any species of matter, but always depends on the presence of a quantity of caloric. Solidity is the natural state of all bodies, and there can be no doubt that every fluid is capable of being rendered solid by a due reduction of temperature; and every solid may be fused by the agency of caloric, if the latter does not decompose them at a temperature inferior to that which would be necessary for their fusion.

Caloric of Fluidity.

Dr. Black was the first who proved that, whenever caloric combines with a solid body, the body becomes heated only, until it is rendered fluid: and that, while it is acquring the fluid state, its temperature remains stationary, though caloric is continued to be added to it. The same is the case when fluids are converted into the aeriform or vaporous state.

From these facts, the laws of latent heat have been inferred. The theory may be illustrated by means of the following experiments:

If a lump of ice, at a low temperature, suppose at 22 deg., be brought into a

warm room, it will become gradually less cold, as may be discovered by means of the thermometer. After a very short time, it will reach the temperature of 32 deg. (the freezing point); but there it stops. The ice then begins to melt; but the process goes on very slowly. During the whole of that time its temperatere continues at 32 deg.; and as it is constantly surrounded by warm air, we have reason to believe that caloric is constantly entering into it; yet it does not become hotter till it is changed into water. Ice, therefore, is converted into water, by a quantity of caloric uniting with it.

It has been found by calculation, that ice in melting absorbs 140 deg. of caloric, the temperature of the water produced still remaining at 32 deg.

This fact may be proved in a direct manner.

Take one pound of ice, at 32 deg., reduced to a coarse powder; put it into a wooden bowl, and pour over it one pound of water, heated to 172 deg.; all the ice will become melted, and the temperature of the whole fluid, if examined by a thermometer, will be 32 deg.; 140 deg. of caloric are therefore lost, and it is this quantity which was requisite to convert the ice into water. This experiment succeeds better, if, instead of ice, fresh-fallen snow be employed.

This caloric has been called *latent caloric*, because its presence is not measurable by the thermometer: also more properly caloric of fluidity.

Dr. Black has also ascertained by experiment, that the fluidity of melted wax, tallow, spermaceti, metals, &c. is owing to the same cause; and Landriani proved, that this is the case with sulphur, alum, nitrate of potassa, &c.

We consider it therefore as a general law, that whenever a solid is converted into a fluid, it combines with caloric, and that is the cause of fluidity.

Conversion of Solids and Fluids into the Aeriform or Gaseous State.

We have seen before, that, in order to render solids fluid, a certain quantity of caloric is necessary, which combines with the body, and therefore cannot be measured by the thermometer; we shall now endeavor to prove that the same holds good in respect to the conversion of solids or fluids into the vaporous or gaseous state.

Take a small quantity of carbonate of ammonia, introduce it into a retort, the neck of which is directed under a cylinder filled with mercury, and inverted in a basin of the same fluid. On applying heat to the body of the retort, the carbonate of ammonia will be volatilized, it will expel the mercury out of the cylinder, and become an invisible gas, and would remain so, if its temperature was not lowered.

The same is the case with benzoic acid, camphire, and various other substances.

All fluids may, by the application of heat, be converted into an aeriform elastic state.

When we consider water in a boiling state, we find that this fluid, when examined by the thermometer, is not hotter after boiling several hours, than when it began to boil, though to maintain it boiling a brisk fire must necessarily be kept up. What then, we may ask, becomes of the wasted caloric? It is not perceptible in the water, nor is it manifested by the steam; for the steam, if not compressed, upon examination, is found not to be hotter than boiling water. The caloric is therefore absorbed by the steam, and although what is so absorbed, is absolutely necessary for the conversion of water into the form of steam; it does not increase its temperature, and is therefore not appreciable by the thermometer.

The conclusion is farther strengthened by the heat given out by steam on its being condensed by cold. This is particularly manifested in the condensation of this fluid in the process of distilling, where, upon examining the refrigeratory, it will be found that a much greater quantity of caloric is communicated to it, than could possibly have been transmitted by the caloric which was sensibly acting before the condensation. This may easily be ascertained by observing the quantity of caloric communicated to the water in the refrigeratory of a still, by any given quantity of liquid that passes over.

1. The boiling point, or the temperature at which the conversion of fluids into gases takes place, is different in different fluids, but constant in each, provided the pressure of the atmosphere be the same.

Put any quanty of sulphuric æther into a Florence flask, suspend a thermometer in it, and hold the flask over an Argand's lamp, the æther will immediately begin to boil, and the thermometer will indicate 98deg., if the æther has been highly rectified.

If highly rectified ardent spirit is heated in a similar manner, the thermometer will rise to 176 deg., and there remain stationary.

If water is substituted it will rise to 212 deg.

If strong nitrous acid of commerce be made use of, it will be found to boil at 248 deg.; sulphuric acid and linseed-oil at 600 deg.; mercury at 656 deg., &c.

2. The boiling point of fluids is raised by pressure.

Mr. Watt heated water under a strong pressure to 400 deg. Yet still, when the pressure was removed, only part of the water was converted into vapor, and the temperature of this vapor, as well as that of the remaining fluid, was no more than 212 deg. There was, therefore, 188 deg. of caloric suddenly lost. This caloric was carried off by the steam. Now as only about one-fifth of the water was converted into steam, that steam must contain not only its own 188 deg., but also the 188 deg. lost by each of the other four parts; that is to say, it must contain 188×5 deg., or about 940 deg. Steam, therefore, is water combined with at least 940 deg. of caloric, the presence of which is not indicated by the thermometer.

3. When pressure is removed from the surface of bodies, their conversion into the gaseous state is greatly facilitated, or their boiling point is lowered.

In proof of this the following experiments may serve:

Let a small bottle be filled with highly rectified sulphuric æther, and a piece of wetted bladder be tied over its orifice around its neck. Transfer it under the receiver of an air-pump, and take away the superincumbent pressure of the air in the receiver. When the exhaustion is complete, pierce the bladder by means of a pointed sliding wire, passing through a collar of leather which covers the upper opening of the receiver. Having done this, the æther will instantly begin to boil, and become converted into an invisible gaseous fluid.

Take a small retort or Florence flask, fill it one half or less with water, and make it boil over a lamp; when kept briskly boiling for about five minutes, cork the mouth of the retort as expeditiously as possible, and remove it from the lamp.

The water, on being removed from the source of heat, will keep boiling for a few minutes, and when the ebullition begins to slacken, it may be renewed by dipping the retort into cold water, or pouring cold water upon it.

The water during boiling becomes converted into vapor; this vapor expels the air of the vessel, and occupies its place; on diminishing the heat it condenses; when the retort is stopped, a partial vacuum is formed; the pressure becomes diminished, and a less degree of heat is sufficient to cause an ebullition.

For the same reason, water may be made to boil under the exhausted receiver at 94 deg. Fah., or even at a lower degree; alcohol at 56 deg., and ether at—20 deg.

On the conversion of fluids into gases, is founded the following experiment, by which water is frozen by means of sulphuric æther.

Take a thin glass tube, four or five inches long, and about two or three eighths of an inch in diameter, and a two ounce bottle furnished with a capillary tube fitted to its neck. In order to make ice, pour a little water into the tube, taking care not to wet the outside, nor to leave it moist. Having done this, let a stream of sulphuric æther fall through the capillary tube upon that part of it containing the water, which by this means will be converted into ice in a few minutes, and this it will do, even near a fire, or in the midst of summer.

If the glass tube containing the water be exposed to the brisk thorough air, or free draught of an open window, a large quantity of water may be frozen in a shorter time; and if a thin spire of wire be introduced previous to the congelation of the water, the ice will adhere to it, and may thus be drawn out conveniently.

A person might be easily frozen to death during very warm weather, by merely pouring upon his body for some time sulphuric æther, and keeping him exposed to a thorough draught of air.

Artificial Refrigeration.

The cooling or refrigeration of rooms in the snmmer season by sprinkling them with water, is on the principle of evaporation.

The method of making ice artificially in the East Indies, depends on the same principle. The ice makers at Benares dig pits in large open plains, the bottom of which they strew with sugar canes, or dried stems of maize, or Indian corn. Upon this bed they place a number of unglazed pans, made of so porous an earth that the water penetrates through their whole substance. These pans are filled toward evening in the winter season with water that has boiled, and left in that situation till morning, when more or less ice is found in them, according to the temperature and other qualities of the air; there being more formed in dry and warm weather than in that which is cloudy, though it may be colder to the human body.

Every thing in this process is calculated to produce cold by evaporation: the beds on which tbe pans are placed suffer the air to have a free passage to their bottoms; and the pans constantly oozing out water to their external surface, are cooled by the evaporation of it.

In Spain they use a kind of earthen jars, called buxaros, which are only half baked, the earth of which is so porous that the outside is kept moist by the water which filters through it; and though placed in the sun, the water in the jar becomes as cold as ice.

It is a common practice in China to cool wine or other liquors by wrapping the bottle in a wet cloth and hanging it up in the sun. The water in the cloth becomes converted into vapor, and thus cold is produced.

The blacks in Senegambia have a similar method of cooling water, by filling tanned leather bags with it, which they hang up in the sun; the water oozes more or less through the leather, so as to keep the outer surface wet, which by its quick and continued evaporation cools the water remarkably.

The winds on the borders of the Persian gulf are often so scorching, that travellers are suddenly suffocated, unless they cover their heads with a wet cloth. If this be too wet, they immediately feel an intolerable cold, which would prove fatal if the moisture was not speedily dissipated by the heat.

Condensation of Vapor.

If a cold vessel is brought into a warm room, particularly where many people are assembled, the outside of it will soon become covered with a sort of dew.

Before some changes of weather, the stone pavements, the walls of a house, the balustrades of stair-cases and other solid objects, feel clammy and damp.

In frosty nights, when the air abroad is colder than the air within, the dampness of this air, for the same reason, settles on the glass panes of the windows, and is there frozen into curious and beautiful figures.

Thus *fogs* and *dews* take place, and in the higher regions clouds are formed from the condensed vapor. The still greater condensation produces *mists* and *rain*.

Capacity of Bodies for containing Heat.

The property which different bodies possess, of containing at the same temperature, and in equal quantities, either of mass or bulk, unequal quantities of heat, is called their capacity for heat. The capacities of bodies for heat are therefore considered as great or small in proportion as their temperatures are either raised by the addition, or diminished by the deprivation of equal quantities of heat, in a less or greater degree.

In homogeneous bodies, the quantities of caloric which they contain are in the ratio of their temperature and mass; when, therefore, equal quantities of water, of oil, or of mercury, of unequal temperatures, are mingled together, the temperature of the whole will be the *arithmetical* mean beween the temperature of the two quantities that had been mixed together. It is a self-evident truth that this should be the case, for the particles of different portions of the same substance being alike, their effects must be equal.

For instance,

Mix a pound of water at 172 deg. with a pound at 32 deg., half the excess of heat in the hot water will quit it to go over into the colder portion; thus the hot water will be cooled 70 deg., and the cold will receive 70 deg. of temperature; therefore, 172—70, or 32+70 = 102, will give the heat of the mixture. To attain the arithmetical mean very exactly, several precautions, however, are necessary.

When heterogeneous bodies of different temperature are mixed together, the temperature produced is never the arithmetical mean of the two original temperatures.

In order to ascertain the comparative quantities of heat of different bodies, equal weights of them are mingled together, the experiments for this purpose being in general more easily executed than those by which they are compared from equal bulks.

Thus, if one pound of mercury heated to 410 deg. Fahren. be added to one pound of water of 44 deg., the temperature of the blended fluids will not be changed to 77 deg., as it would be if the surplus of heat were divided among those fluids in the proportion of their quantities. It will be found, on examination, to be only 47 deg.

On the contrary, if the pound of mercury be heated to 44 deg. and the water to 110 deg., then, on stirring them together, the common temperature will be 107 deg.

Hence, if the quicksilver loses by this distribution 63 deg. of caloric, an equal weight of water gains only 3 deg. from this loss of 63 deg. of heat. And, on the contrary, if the water loses 3 deg. the mercury gains 63 deg.

When, instead of comparing the quantities of caloric which equal *weights* of different bodies contain, we compare the quantities contained in equal *volumes*, we still find that an obvious difference takes place. Thus it is found by experiment, that the quantity of caloric necessary to raise the temperature of a given volume of water any number of degrees, is, to that necessary to raise an equal volume of mercury the same number of degrees, as 2 to 1. This is, therefore, the proportion between the comparative quantities of caloric which these two bodies contain, estimated by their volumes; and similar differences exist with respect to every other kind of matter.

From the nature of the experiments by which the quantities of caloric which bodies contain are ascertained, it is evident that we discover merely the *comparative*, not the *absolute* quantities. Hence water has been chosen as a standard, to which other bodies may be referred; its capacity is stated as the arbitrary term of 1000, and with this the capacities of other bodies are compared.

It need not be told, that pains have been taken to estimate on these experiments that portion of heat which diffuses itself into the air, or into the vessels where the mercury and water are blended together. As, however, such valuations cannot be made with complete accuracy, the numbers stated above are only an approximation to truth.

Radiation of Caloric.

Caloric is thrown off or radiates from heated bodies in right lines, and moves through space with inconceivable velocity. It is retarded in its passage by atmospheric air, by colorless fluids, glass, and other transparent bodies.

If a glass mirror be placed before a fire, the mirror transmits the rays of light, but not the rays of heat.

If a plate of glass, talc, or a glass vessel filled with water, be suddenly interposed between the fire and the eye, the rays of light pass through it, but the rays of caloric are considerably retarded in its passage; for no heat is perceived until the interposed substance is saturated with heat, or has reached its *maximum*. It then ceases to intercept the rays of caloric, and allows them to pass as freely as the rays of light.

It has been lately shown by Dr. Herschel, that the rays of caloric are refrangible, but less so than the rays of light; and the same philosopher has also proved by experiment, that it is not only the rays of caloric emitted by the

sun which are refrangible, but likewise the rays emitted by common fires, by candles, by heated iron, and even by hot water.

Whether the rays of caloric are differently refracted, in different mediums, has not yet been ascertained. We are certain, however, that they are refracted by all transparent bodies which have been employed as burning glasses.

The rays of caloric are also reflected by polished surfaces in the same manner as the rays of light.

This was long ago noticed by Lambert, Saussure, Scheele, Pictet, and lately by Dr. Herschel.

Professor Pictet placed two concave metallic mirrors opposite to each other at the distance of about twelve feet. When a hot body, an iron bullet for instance, was placed in the focus of one, and a mercurial thermometer in that of the other, a substance radiated from the bullet; it passed with incalculable velocity through the air, it was reflected from the mirrors, it became concentrated, and influenced the thermometer placed in the focus, according to the degree of its concentration.

An iron ball two inches in diameter, heated so that it was not luminous in the dark, raised the thermometer not less than ten and a half degrees of Raumer's scale, in six minutes.

A lighted candle occasioned a rise in the thermometer nearly the same.

A Florence flask containing two ounces and three drachms of boiling water raised Fahrenheit's thermometer three degrees. He blackened the bulb of his thermometer, and found that it was more speedily influenced by the radiation than before, and that it rose to a greater height.

M. Pictet discovered another very singular fact; namely, the *apparent radiation of cold.* When instead of a heated body, a Florence flask full of ice or snow is placed in the focus of one of the mirrors, the thermometer placed in the focus of the other immediately descends, and ascends again whenever the cold body is removed.

This phenomenon may be explained on the supposition, that from every body at every temperature caloric radiates, but in the less quantity as the temperature is low; so that in the above experiment, the thermometer gives out more caloric by radiation than it receives from the body in the opposite focus, and therefore its temperature is lowered. Or, as Pictit has supposed, when several bodies near each other have the same temperature, there is no radiation of caloric, because in all of them it exists in a state of equal tension; but as soon as a body at an inferior temperature is introduced the balance of tension is broken, and caloric begins to radiate from all of them, till the temperature of that body is raised to an equality with theirs. In the above experiment, therefore, the placing the snow or ice in the focus of the mirror causes the radiation of caloric *from* the thermometer, and hence the diminution of temperature which it suffers.

These experiments have been since repeated by Dr. Young and Professor Davy, at the theatre of the Royal Institution. These gentlemen inflamed phosphorus by reflected caloric, and proved that the heat thus excited was very sensible to the organs of feeling.

It is therefore evident, that caloric is thrown off from bodies in rays, which are invisible, or incapable of exciting vision, but which are capable of exciting heat.

These invisible rays of caloric are propagated by right lines, with extreme velocity; and are capable of the laws of reflection and refraction.

The heating agency however is different in the different colored rays of the prismatic spectrum. According to Dr. Herschel's experiments, it follows inversely the order of the refrangibility of the rays of light. The least refrangible, possessing it in the greatest degree.

Sir Henry Englefield has lately made a series of experiments on the same subject, from which we learn, that a thermometer having its ball blackened, rose when placed in the *blue* ray of the prismatic spectrum in 3 min. from 55 deg. to 56 deg.; in the *green*, in 3 min. from 54 deg. to 58 deg.; in the *yellow*, in 3 min. from 56 deg. to 62 deg.; in the *full red*, in 2 1-2 min. from 56 deg. to 72 deg.; in the *confines of the red*, in 2 1-2 min. from 58 deg. to 73 1-2 deg.; and *quite out of the visible light*, in 2 1-2 min. from 61 deg. to 79 deg.

Between each of the observations, the thermometer was placed in the shade so long as to sink it below the heat to which it had risen in the preceding observation; of course its rise above that point could only be the effect of the ray to which it was exposed. It was continued in the focus long after it had ceased to rise; therefore the heats given are the greatest effects of the several rays on the thermometer in each observation. A thermometer placed constantly in the shade near the apparatus, was found scarcely to vary during the experiments.

Sir Henry made other experiments with thermometers with naked balls, and with others whose balls were painted white, for which we refer the reader to the interesting paper of the Baronet, from which the above experiments are transcribed.

Production of Artificial Cold, by means of Frigorific Mixtures.

A number of experiments have been lately made by different philosophers, especially by Pepys, Walker, and Lowitz, in order to produce artificial cold. And as these methods are often employed in chemistry, with a view to expose bodies to the influence of very low temperatures, we shall enumerate in a tabular form the different substances which may be made use of for that purpose, and the degrees of cold which they are capable of producing.

To produce the effects stated in the table, the salts must be reduced to powder, and contain their full quantity of water of crystalization. The vessel in which the freezing mixture is made, should be very thin, and just large enough to hold it, and the materials should be mixed together as expeditiously as possible, taking care to stir the mixture at the same time with a rod of glass or wood.

In order to obtain the full effect, the materials ought to be first cooled to the temperature marked in the *table*, by introducing them into some of the other frigorific mixtures, and then mingling them together in a similar mixture. If, for instance, we wish to produce—46 deg., the snow and diluted nitric acid ought to be cooled down to 0 deg., by putting the vessel which contains each of them into the fifth freezing mixture in the following table, before they are mingled together. If a more intense cold be required, the materials to produce it are to be brought to the proper temperature by being previously placed in the second freezing mixture.

This process is to be continued till the required degree of cold has been procured.

A TABLE OF FREEZING MIXTURES.

Mixtures.		*Thermometer sinks.*
Muriate of ammonia......	5 parts	From 50 deg. to 10 deg.
Nitrate of Potassa........	5	
Water..................	16	
Muriate of ammonia......	5 parts	From 50 deg. to 4 deg.
Nitrate of Potassa........	5	
Sulphate of soda.........	8	
Water..................	16	
Sulphate of soda.........	3 parts	From 50 deg. to—3 deg.
Diluted nitric acid........	2	
Sulphate of soda.........	8 parts	From 50 deg. to 0 deg.
Muriatic acid............	5	
Snow..................	1 part	From 32 deg. to 0 deg.
Muriate of soda..........	1	
Snow, or pounded ice....	2 parts	From 0 deg. to—5 deg.
Muriate of soda..........	1 part	
Snow, or pounded ice.....	12 parts	From —5 deg. to —18 deg.
Muriate of soda..........	5	
Muriate of ammonia and nitrate of potassa.......	5	

Snow, or pounded ice..... 12 parts Muriate of soda.......... 5 Nitrate of ammonia....... 5		From —18 deg. to —25 deg.
Snow.................... 3 parts Diluted nitric acid........ 2		From 0 deg. to —46 deg.
Muriate of lime.......... 3 parts Snow.................... 2		From 32 deg. to —50 deg.
Potassa................. 4 parts Snow.................... 3		From 32 deg. to —51 deg.
Snow.................... 8 parts Diluted sulphuric acid.... 3 Diluted nitric acid........ 3		From —10 deg. to —56 deg.
Snow.................... 1 part Diluted sulphuric acid.... 1		From 20 deg. to —60 deg.
Muriate of lime.......... 2 parts Snow.................... 1 part		From 0 deg. to —66 deg.
Muriate of lime.......... 3 parts Snow.................... 1 part		From —40 deg. to —73 deg.
Diluted sulphuric acid.... 10 parts Snow.................... 8		From —68 deg. to —91 deg.
Nitrate of ammonia...... 1 part Water.................... 1		From 50 deg. to 4 deg.
Nitrate of ammonia...... 1 part Carbonate of soda........ 1 Water.................... 1		From 50 deg. to —7 deg.
Sulphate of soda......... 6 parts Muriate of ammonia..... 4 Nitrate of potassa........ 2 Diluted nitric acid........ 4		From 50 deg. to —10 deg.
Sulphate of soda......... 6 parts Nitrate of ammonia...... 5 Diluted nitric acid........ 4		From 50 deg. to —14 deg.
Phosphate of soda........ 9 parts Diluted nitric acid........ 4		From 50 deg. to —12 deg.
Phosphate of soda........ 9 parts Nitrate of ammonia....... 6 Diluted nitric acid........ 4		From 50 deg. to 21 deg.
Sulphate of soda.......... 5 parts Diluted sulphuric acid.... 4		From 50 deg. to 3 deg.

LIGHT.—*Lux.*

The nature of light has occupied much of the attention of philosophers, and numerous opinions have been entertained concerning it. It has been sometimes considered as a distinct substance, at other times as a quality; sometimes as a cause, frequently as an effect; by some it has been considered as a compound, by others as a simple substance. Philosophers of the present day are mostly agreed as to the independent existence of light, or the cause by which we see.

Nature of Light.

Light is that which proceeds from any body producing the sensation of vision, or perception of other bodies, by depicting an image of external objects on the retina of the eye. Hence it announces to animals the presence of the bodies which surround them, and enables them to distinguish these bodies into transparent, opaque, and colored. These properties are so essentially con-

nected with the presence of light, that bodies lose them in the dark, and become undistinguishable.

Light is regarded by philosophers as a substance consisting of a vast number of exceedingly small particles, which are actually projected from luminous bodies, and which probably never return again to the body from which they were emitted.

It is universally expanded through space. It exerts peculiar actions, and is obedient to the laws of attraction, and other properties of matter.

Explanation of certain terms of light.

In order to facilitate the doctrine of light, we shall shortly explain a few terms made use of by philosophers when treating of it; namely,

A *ray of light* is an exceedingly small portion of light as it comes from a luminous body.

A *medium* is a body which affords a passage for the rays of light.

A *beam of light* is a body of parallel rays.

A *pencil of rays* is a body of diverging or converging rays.

Converging rays are rays which tend to a common point.

Diverging rays are those which come from a point, and continually separate as they proceed.

The rays of light are *parallel*, when the lines which they describe are so.

The *radiant point* is the point from which diverging rays proceed.

The *focus* is the point to which the converging rays are directed.

Sources of Light.

Light is emitted from the sun and fixed stars, and other luminous bodies. It is produced by percussion, during electrization, combustion, and in various other chemical processes.

Why the sun and stars are constantly emitting light, is a question which probably will forever baffle human understanding.

The light emitted during combustion, exists previously, either combined with the combustible body, or with the substance which supports the combustion. The light liberated during chemical action, formed a constituent part of the bodies which act on each other.

Chemical Properties of Light.

The chemical effects of light have much engaged the attention of philosophers. Its influence upon animal, vegetable, and other substances, is as follows:

1. *On Vegetables.*

Every body knows, that most of the discous flowers follow the sun in his course; that they attend him to his evening retreat, and meet his rising lustre in the morning with the same unerring law. It is also well known, that the change of position in the leaves of plants at different periods of the day, is entirely owing to the agency of light, and that plants which grow in windows in the inside of houses, are as it were solicitous to turn their leaves towards the light. Natural philosophers have long been aware of the influence of light on vegetation. It was first observed, that plants growing in the shade, or darkness, are pale and without color. The term *etiolation* has been given to this phenomenon, and the plants in which it takes place are said to be *etiolated* or *blanched*. Gardeners avail themselves of the knowledge of this fact to furnish our tables with white and tender vegetables. When the plants have attained a certain height, they compress the leaves, by tying them together, and by these means, (or by laying earth over them,) deprive them of the contact of light: and thus it is, that our white celery, lettuce, cabbage, endive, &c. are obtained. For the same reason, wood is white under the green bark; and roots are less colored than plants; some of them alter their taste, &c.; they even acquire a deleterious quality when suffered to grow exposed to light. Potatoes are of this kind. Herbs that grow beneath stones, or in places utterly dark, are white, soft, aqueous, and of a mild and insipid taste. The more plants are exposed to the light, the *more color* they acquire. Though plants

are capable of being nourished exceedingly well in the dark, and in that state grow much more rapidly than in the sun, (provided the air that surrounds them is fit for vegetation,) they are colorless and unfit for use.

Professor Davy found by experiment, that red rose trees, carefully excluded from the light, produce roses almost white. He likewise ascertained that this flower owes its color to light entering into its composition; that pink, orange, and yellow flowers, imbibe a smaller portion of light than red ones, and that white flowers contain no light. But vegetables are not only indebted to the light for their color; taste and odor are likewise derived from the same source.

Light contributes greatly to the maturity of fruits and seeds. This seems to be the cause why, under the burning sun of Africa, vegetables are in general more odoriferous, of a stronger taste, and more abounding with resin. From the same cause it happens, that hot climates seem to be the native countries of perfumes, odoriferous fruits, and aromatic resins.

The action of light is so powerful on the organs of vegetables, as to cause them to pour forth torrents of pure air from the surface of their leaves into the atmosphere, while exposed to the sun; whereas on the contrary, when in the shade they emit an air of a noxious quality. Take a few handfuls of fresh gathered leaves of mint, cabbage, or any other plant; place them in a bell-glass, filled with fresh water, and invert it into a basin with the same fluid. If the whole be then exposed to the direct rays of the sun, small air bubbles will appear upon the surface of the leaves, which will gradually grow larger, and at last detatch themselves, and become collected at the surface of the water. This is oxygen gas, or vital air.

All plants do not emit this air with the same facility; there are some which yield it the moment the sun acts upon them; as the jacobœa or ragwort, lavender, peppermint, and some other aromatic plants. The leaves afford more air when attached to the plant than when gathered; the quantity is also greater, the fresher and sounder they are, and if full grown and collected during dry weather. Green plants afford more air than those which are of a yellowish or white color. Green fruits afford likewise oxygen gas; but it is not so plentifully furnished by those which are ripe. Flowers in general render the air noxious. The nasturtion indicum, in the course of a few hours, gives out more air than is equal to the bulk of all its leaves. On the contrary, if a like bell-glass, prepared in the same manner, be kept in the dark, another kind of air will be disengaged, of an opposite quality.

There is not a substance which, in well closed glass vessels, and exposed to the sun's light, does not experience some alteration.

Camphor, kept in glass bottles, exposed to light, crystallizes into the most beautiful symmetrical figures, on that side of the glass which is exposed to the light.

Yellow wax exposed to the light loses its color and becomes bleached. Gum guaiacum, reduced to powder, becomes green on exposure to light. Vegetable colors, such as those of saffron, log-wood, &c. become pale, or white, &c.

2. *On Animals.*

The human being is equally dependent on the influence of light. Animals in general droop when deprived of light; they become unhealthy, and even sometimes die. When a man has been long confined in a dark dungeon, (though well aired) his whole complexion becomes sallow; pustules, filled with aqueous humors, break out on his skin; and the person who has been thus deprived of light becomes languid, and frequently dropsical. Worms, grubs, and caterpillars, which live in the earth, or in wood, are of a whitish color; moths, and other insects of the night, are likewise distinguishable from those which fly by day, by the want of brilliancy in their color. The difference between those insects, in northern and southern parts, is still more obvious.

The parts of fish which are exposed to light, as the back, fins, &c. are uniformly colored, but the belly, which is deprived of light, is white in all of them.

Birds which inhabit the tropical conutries have much brighter plumage than

those of the north. Those parts of the birds which are not exposed to the light are uniformly pale. The feathers on the belly of a bird are generally pale or white; the back, which is exposed to the light, is almost always colored; the breast, which is particularly exposed to light in most birds, is brighter than the belly.

Butterflies, and various other animals of equatorial countries, are brighter colored than those of the polar regions. Some of the northern animals are even darker in summer and paler in winter.

3. *On other substances.*

Certain metallic oxydes become combustible when exposed to light; and acids, as the nitric, &c. are decomposed by its contact, and various other substances change their nature.

AIR.

This term was, till lately, used as the generic name for such invisible and exceeedingly rare fluids as possess a very high degree of elasticity, and are not condensible into the liquid state by any degree of cold hitherto produced; but as this term is commonly employed to signify that compound of aeriform fluids which constitutes our atmosphere, it has been deemed advisable to restrict it to this signification, and to employ as the generic term the word Gas, for the different kinds of air, except what relates to our atmospheric compound.

Air, atmospheric.

"The immense mass of permanently elastic fluid which surrounds the globe we inhabit," says Dr. Ure, "must consist of a general assemblage of every kind of air which can be formed by the various bodies that compose its surface. Most of these, however, are absorbed by water; a number of them are decomposed by combination with each other; and some of them are seldom disengaged in considerable quantities by the processes of nature. Hence it is that the lower atmosphere consists chiefly of oxygen and nitrogen, together with moisture and the occasional vapors or exhalations of bodies. The upper atmosphere seems to be composed of a large proportion of hydrogen, a fluid of so much less specific gravity than any other, that it must naturally ascend to the highest place, where, being occasionally set on fire by electricity, it appears to be the cause of the aurora borealis and fire-balls. It may easily be understood, that this will only happen on the confines of the respective masses of common atmospherical air, and of the inflammable air; that the combustion will extend progressively, though rapidly, in flashings from the place where it commences; and that when by any means a stream of inflammable air, in its progress toward the upper atmosphere, is set on fire at one end, its ignition may be much more rapid than what happens higher up, where oxygen is wanting, and at the same time more defi-

nite in its figure and progression, so as to form the appearance of a fire-ball.

That the air of the atmosphere is so transparent as to be invisible except by the blue color it reflects when in large masses, as is seen in the sky or region above us, or in viewing extensive landscapes; that it is without smell, except that of electricity, which it sometimes very manifestly exhibits; altogether without taste and impalpable: not condensible by any degree of cold into the dense fluid state, though easily changing its dimensions with its temperature; that it gravitates and is highly elastic; are among the numerous observations and discoveries which do honor to the sagacity of the philosophers of the seventeenth century. They likewise knew that this fluid is indispensably necessary to combustion, but no one, except the great, though neglected, John Mayow, appears to have formed any proper notion of its manner of acting in that process.

The air of the atmosphere, like other fluids, appears to be capable of holding bodies in solution. It takes up water in considerable quantities, with a diminution of its own specific gravity: from which circumstance, as well as from the consideration that water rises very plentifully in the vaporous state *in vacuo*, it seems probable that the air suspends vapor, not so much by a real solution, as by keeping its particles asunder, and preventing their condensation. Water likewise dissolves or absorbs air.

Mere heating or cooling does not affect the chemical properties of atmospherical air; but actual combustion, or any process of the same nature, combines its oxygen and leaves its nitrogen separate. Whenever a process of this kind is carried on in a vessel containing atmospherical air, which is enclosed either by inverting the vessel over mercury, or by stopping its aperture in a proper manner, it is found that the process ceases after a certain time; and that the remaining air (if a combustible body capable of solidifying the oxygen, such as phosphorus, have been employed,) has lost about a fifth part of its volume, and is of such a nature as to be incapable of maintaining any combustion for a second time, or of supporting the life of animals. From these experiments it is clear, that one of the following deductions must be true:—1. The combustible body has emitted some principle, which, by combining with the air, has rendered it unfit for the purpose of further combustion; or, 2. It has absorbed part of the air which was fit for that purpose, and has left a residue of a different nature; or, 3. Both events have happened; namely, that the pure part of the air has been absorbed, and a principal has been emitted, which has changed the original properties of the remainder.

The facts must clear up these theories. The first induction cannot be true, because the residual air is not only of less bulk, but of less specific gravity, than before. The air cannot therefore have received so much as it has lost. The second is the doctrine of the philosophers who deny the existence of phlogiston, or a principle of inflammability; and the third must be adopted by those who maintain that such a principle escapes from bodies during combustion. This residue was called phlogisticated air, in consequence of such an opinion.

In the opinion that inflammable air is the phlogiston, it is not necessary to reject the second inference that the air has been no otherwise changed than by the mere subtraction of one of its principles; for the pure or vital part of the air may unite with inflammable air supposed to exist in a fixed state in the combustible body; and if the product of this union still continues fixed, it is evident, that the residue of the air, after combustion, will be the same as it would have been if the vital part had been absorbed by any other fixed body. Or, if the vital air be absorbed while inflammable air or phlogiston is disengaged, and unites with the aeriform residue, his residue will not be heavier than before, unless the inflammable air it has gained exceeds in weight the vital air it has lost; and if the inflammable air falls short of that weight the residue will be lighter.

These theories it was necessary to mention; but it has been sufficiently proved by various experiments, that combustible bodies take oxygen from the atmosphere, and leave nitrogen; and that when these two fluids are again mixed in due proportions, they compose a mixture not differing from atmospherical air.

The respiration of animals produces the same effect on atmospherical air as combustion does, and their constant heat appears to be an effect of the same nature. When an animal is included in a limited quantity of atmospherical air, it dies as soon as the oxygen is consumed; and no other air will maintain animal life but oxygen, or a mixture which contains it. Pure oxygen maintains the life of animals much longer than atmospherical air, bulk for bulk.

It is to be particularly observed, however, that, in many cases of combustion, the oxygen of the air, in combining with the combustible body, produces a compound, not solid, or liquid, but aeriform. The residual air will therefore be a mixture of the nitrogen of the atmosphere with the consumed oxygen, converted into another gas. Thus, in burning charcoal, the carbonic acid gas generated, mixes with the residual nitrogen, and makes up exactly, when the effect of heat ceases, the bulk of the original air. The breathing of animals, in like manner,

changes the oxygen into carbonic acid gas, without altering the atmospherical volume.

There are many provisions in nature by which the proportion of oxygen in the atmosphere, which is continually consumed in respiration and combustion, is again restored to that fluid. In fact there appears, as far as an estimate can be formed of the great and general operations of nature, to be at least as great an emission of oxygen as is sufficient to keep the general mass of the atmosphere at the same degree of purity. Thus, in volcanic eruptions, there seems to be at least as much oxygen emitted or extricated by fire from various minerals, as is sufficient to maintain the combustion, and perhaps even to meliorate the atmosphere. And in the bodies of plants and animals, which appear in a great measure to derive their sustenance and augmentation from the atmosphere and its contents, it is found that a large proportion of nitrogen exists. Most plants emit oxygen in the sunshine, from which it is highly probable that they imbibe and decompose the air of the atmosphere, retaining carbon, and emitting the vital part. Lastly, if to this we add the decomposition of water, there will be numerous occasions in which this fluid will supply us with disengaged oxygen; while, by a very rational supposition, its hydrogen may be considered as having entered into the bodies of plants for the formation of oils, sugars, mucilages, &c., from which it may be again extricated.

To determine the respirability or purity of air, it is evident that recourse must be had to its comparative efficacy in maintaining combustion, or some other equivalent process.

From the latest and most accurate experiments, the proportion of oxygen in atmospheric air is by measure about 21 per cent.; and it appears to be very nearly the same, whether it be in this country or on the coast of Guinea, on low plains or lofty mountains, or even at the height of 7250 yards above the level of the sea, as ascertained by Gay Lussac, in his aerial voyage in September, 1805. The remainder of the air is nitrogen, with a small portion of aqueous vapor, amounting to about one per cent. in the driest weather, and a still less portion of carbonic acid, not exceeding a thousandth part of the whole.

As oxygen and nitrogen differ in specific gravity in the proportion of 135 to 121, according to Kirwan, and of 139 to 120, according to Davy, it has been presumed, that the oxygen would be more abundant in the lower regions, and the nitrogen in the higher, if they constituted a mere mechanical mixture, which appears contrary to the fact. On the other hand, it has been urged, that they cannot be in the state of chemical combination, because they both retain their distinct properties unaltered, and no change of temperature or density takes place on

their union. But perhaps it may be said, that, as they have no repugnance to mix with each other, as oil and water have, the continual agitation to which the atmosphere is exposed, may be sufficient to prevent two fluids, differing not more than oxygen and nitrogen in gravity, from separating by subsidence, though simply mixed. On the contrary, it may be argued, that to say chemical combination cannot take place without producing new properties, which did not exist before in the component parts, is merely begging the question; for though this generally appears to be the case, and often in a very striking manner, yet combination does not always produce a change of properties, as appears in M. Biot's experiments with various substances; of which we may instance water, the refraction of which is precisely the mean of that of the oxygen and hydrogen, which are indisputably combined in it.

To get rid of the difficulty, Mr. Dalton of Manchester framed an ingenious hypothesis, that the particles of different gases neither attract nor repel each other; so that one gas expands by the repulsion of its own particles, without any more interruption from the presence of another gas, than if it were in a vacuum. This would account for the state of atmospheric air, it is true, but it does not agree with certain facts. In the case of the carbonic acid gas in the Grotto del Cano, and over the surface of brewers' vats, why does not this gas expand itself freely upward, if the superincumbent gases do not press upon it? Mr. Dalton himself, too, instances as an argument for his hypothesis, that oxygen and hydrogen gases, when mixed by agitation, do not separate on standing. But why should either oxygen or hydrogen require agitation, to diffuse it through a vacuum, in which, according to Mr. Dalton, it is placed?

The theory of Berthollet appears consistent with all the facts, and sufficient to account for the phenomenon. If two bodies be capable of chemical combination, their particles must have a mutual attraction for each other. This attraction, however, may be so opposed by concomitant circumstances, that it may be diminished in any degree. Thus we know, that the affinity of aggregation may occasion a body to combine slowly with a substance for which it has a powerful affinity, or even entirely prevent its combining with it; the presence of a third substance may equally prevent the combination; and so may the absence of a certain quantity of caloric. But in all these cases the attraction of the particles must subsist, though diminished or counteracted by opposing circumstances. Now we know that oxygen and nitrogen are capable of combination; their particles, therefore, must attract each other; but in the circumstances in which they are placed in our atmosphere, that attraction is prevented from exerting itself, to such a degree as to

form them into a chemical compound, though it operates with sufficient force to prevent their separating by their difference of specific gravity. Thus the state of the atmosphere is accounted for, and every difficulty obviated, without any new hypothesis.

The exact specific gravity of atmospherical air, compared to that of water, is a very nice and important problem. By reducing to 60 deg. of Fahr. and to 30 inches of the barometer, the results obtained with great care by Biot and Arago, the specific gravity of atmospherical air, appears to be 0.001220, water being represented by 1.000000. This relation expressed fractionally is 1-820, or water is 820 times denser than atmospherical air. Mr. Rice, in the 77th and 78th numbers of the Annals of Philosophy, deduces from Sir George Shuckburgh's experiments 0.00120855 for the specific gravity of air. This number gives water to air as 827.437 to 1. If with Mr. Rice we take the cubic inch of water=252.525 gr., then 100 cubic inches of air by Biot's experiments will weigh 30.808 grains, and by Mr. Rice's estimate 30.519. He considers with Dr. Prout the atmosphere to be a compound of 4 volumes of nitrogen, and 1 of oxygen; the specific gravity of the first being to that of the second as 1.1111 to 0.9722. Hence

0.8 vol nitr. sp. gr.	0.001166=0.000933
0.2 oxy.	0.001340=0.000268
	0.001201

The numbers are transposed in the Annals of Philosophy by some mistake.

Biot and Arago found the specific gravity of oxygen to be

	1.10359
and that of nitrogen,	0.96913
air being reckoned,	1.00000

Or compared to water as unity,—

Nitrogen is	0.001182338	
Oxygen,	0.001346379	
And 0.8 nitrogen		=0.00094587
0.2 oxygen		=0.00026927
		0.00121514
And 0.79 nitrogen,		=0.000934
0.21 oxygen		=0.000283
		0.001217

A number which approaches very nearly to the result of experiment. Many analogies, it must be confessed, favor Dr. Prout's proportions; but the greater number of experiments on

the composition and density of the atmosphere agree with Biot's results. Nothing can decide these fundamental chemical proportions, xcept a new, elaborate, and most minutely accurate series of experiments. We shall then know whether the atmosphere contains in volume 20 or 21 per cent."—*Ure's Chem. Dict.*

2d. MATTER ORGANIZED—OR THE OUTLINES OF ANATOMY.

When we look at the wonderful machine which the Deity has placed upon the earth, to preside over his creation—when we consider the beautiful adaptation of its various parts to the purposes for which they are designed—we are struck with awe and admiration, even upon a superficial glance at its beauty and propriety. But when we penetrate beneath the surface, and behold the play of its ten thousand arteries carrying sustenance to every part of the system—the veins returning their purple current to the heart and lungs, to be re-supplied with the elements of life; when we observe the lacteals taking up the nutritious particles from the bowels, and conveying them through countless channels to be mingled with the blood—the absorbents removing those parts which are no longer fitted to fulfil their duty, and the glands rejecting them from the body as useless incumbrances, while the vessels again supply their place with fresh materials; when we reflect, I say, that this most intricate machine is so constantly undergoing waste and repair, that in a very few years it loses every individual atom which formed a part of its original structure, while it still preserves its form and motions unimpaired, we are lost in wonder; not less at the wise ordinations of Nature that regulate its operations, than at the audacity of those who dare to interfere with her arrangements, even when disorder is perceived among the wheels and springs of this masterpiece of Divine wisdom and power.

But Nature governs all her works by a few simple laws; and when these laws are discovered, the explanation of her most involved phenomena are often brought within the grasp of human reason. By contemplating the fall of an apple, Newton was enabled to expose the hidden cause of all the movements of the heavenly bodies. Now, although we have not arrived at nearly the same simplicity in the study of the science of life which that philosopher has reached in speculating on natural philosophy, we have discovered many general principles which shed no inconsiderable light on the otherwise incomprehensible operations of the human frame, in health and in disease. Let us then proceed to elucidate these principles, as far as the limits and the object of this work will permit.

The simplest of all animals, which mostly reside in the

water, appear to be entirely divested of feeling, or voluntary motion; they have no blood-vessels, no nerves, no intestines, no organs; they are composed of a kind of membrane containing many cells and fibres of different shapes and sizes, filled and surrounded with a peculiar fluid. In structure they are not unlike a sponge, enclosed in a bladder of the same substance, and shaped into different forms according to the species. In composition this membrane does not differ very widely from the white of an egg when boiled. Such is the picture of the simplest specimens of animal life; and although the labors of recent naturalists have proved the existence of more complex organs in many of the tribes of minute beings, whose existence is scarcely perceptible, except by the aid of powerful microscopes, there are not wanting many of much larger size, and, therefore, open to accurate observation, in whom the whole body is devoid of any systematic arrangement, other than that which has been just described.

These animals live by imbibing their sustenance through the skin from the fluid in which they swim, and as they select such particles as are fitted to their wants, they may be said to perform a kind of external digestion. The membrane of which they are composed is supposed to contract when touched, and also when acted on by light, heat, electricity, and perhaps other causes; thus the fluids which it contains are agitated and moved from place to place, so that an imperfect kind of circulation is effected without the aid of blood-vessels, and all parts of the body are nourished and furnished with the means of growth. If respiration be necessary to these animals, it must be effected by the external surface, and whatever matters require to be ejected from the body are compelled to pass by the same route. This substance of which they are composed, and which is called cellular membrane, or cellular tissue, seems, therefore, to be capable of fulfilling all the functions of life, as far as they are necessary to the existence of the most simple animals; and, strange as it may appear, even the human embryo, when it first becomes visible, and for some time afterward, cannot be distinguished from a small mass of cellular tissue! Although it is obvious that it must be endowed with life, it contains no vessels nor organs, but resembles a mere piece of animated jelly.

When we begin to examine animals more and more advanced in the scale of nature, we find that those which are designed to move about in search of food, instead of having their food brought to them, require to be furnished with organs especially devoted to this purpose. They have muscles; for the occasional, and, as it were, accidental, contractions of the cellular tissue, are too irregular and uncertain to answer their necessities, and they require an apparatus for *locomotion*. From the

moment that the character of perfect simplicity is thus lost, it seems that mere absorption from the surface is insufficient to supply the materials for the different organs, and the animal is supplied with an internal cavity or stomach, and bowels more or less complex in structure, in which food may be enclosed until it can undergo a more careful and deliberate *digestion.* Still these muscles of which we have spoken, though they look like fibres of considerable length, are thought by most to be in reality composed of globules or particles, ranged in rows in the midst of the cellular tissue, which ties them together in bundles, and keeps each particle in its proper place ; they are strictly interstitial deposites, filling the cavities and adhering to the layers of the membrane.

Now the movements of the muscles would be embarrassed, and perhaps destroyed, if the liquids which support life were permitted to pervade the whole body in these, as they do in the simplest animals, which have no well defined organs ; the nutritive fluid or blood is, therefore, generally enclosed in distinct vessels, formed ultimately of the same cellular tissue, but having no communication with its cells. These vessels divide and re-divide, carrying the blood to every part of the body, and returning it again to a reservoir, or *heart*, which forms the centre of the *circulation.*

As every part of the body receives its nourishment from the blood, it is obvious that this fluid is constantly undergoing considerable waste; nature has, therefore, provided a system of vessels which is rather an appendage to the circulatory apparatus than a part of it. These vessels, which physicians call the *lacteals*, arise in countless numbers from every part of the bowels. They take up, by some invisible means, such parts of the food as are suited to enter the blood, leaving the rest to be ejected from the body by the natural passages. They pursue a winding course, uniting gradually with each other, and thus becoming larger, as the little streams from a thousand springs are slowly collected first into rivulets, then into brooks, until at length they give rise to a noble river. The river of the lacteals into which they are all finally collected, is in man, a vessel about as large as a crow-quill, which, running for some distance along the spine, near the back part of the chest, empties its contents into one of the principal veins of the body, just before it enters the heart.

The *heart* is a strong hollow muscle, which alternately receives the blood as it flows toward it, and then forces it by a strong contraction through vessels, which go on continually branching until they reach every part of the system, like the limbs and twigs of a great tree.

The principal trunk and great branches of this class of ves-

sels are termed *arteries* ; the blood is propelled through them chiefly by the direct force of the heart, but they are provided with a coat or envelope of fibres resembling those of muscles, which aid in urging the current more uniformly in proper directions, and as the arteries grow smaller, these fibres increase in their relative strength, as the bark of the smaller twigs becomes thicker in proportion than that of the body of the tree. At length these little arteries become capable of hastening or retarding the flow of blood, and sometimes perhaps they check it altogether for a moment. They now change their name, and are called the *capillaries*.

It is through the capillaries that all those particles which are required for the growth and preservation of the body and its several organs are separated from the blood and placed in their proper stations. The same vessels are supposed by some to take up and mingle with the blood those particles which have done their duty and are worn out in the service, in order that they may be disposed of, in the manner in which most bodies corporate reward the past services of friends no longer found necessary; that is, by being turned out of doors. In this most thankless duty, however, they are certainly aided by a subsidiary class of vessels called the *absorbents*, which convey only colorless fluids collected from all parts of the body. Most of these last named vessels finally empty their contents into the common trunk of the lacteals, and thus into the veins, but some of them reach the same destination by a more direct route.

This constant addition of nutritive matter to the blood *by the lacteals*, its distribution to every organ of the animal *by the heart and arteries*, its separation from the mass of circulation, and its application to the growth and repair of all parts *by the capillaries*, together with the removal of injured, useless or debilitated particles *by the absorbents*, are subjects connected with the all-important process of *nutrition*.

After the blood has passed the capillaries it falls into another system of vessels called the *veins*, by which it is returned to the heart. The veins are destitute of the seemingly muscular coat of the arteries and capillaries, and although the blood is constantly pushed into them by the joint action of the heart, the arteries and the capillaries, they are unable to propel it by any effort of their own; they are mere passive conduits. To supply this apparent defect, they are provided with numerous valves, set here and there along their course, which permit the blood to pass toward the heart, but prevent its return in the opposite direction. By the constant motion of the muscles in breathing, walking, coughing, sneezing, &c., the veins are very frequently compressed, and their contents urged forward more rapidly; hence the healthfulness of exercise and gymnastics.

All the veins of the body are gradually collected into a few great trunks or canals, which pour their contents into the heart, and those which belong to the general circulation—that circulation which is destined to supply nutriment to the body—form, in the more perfect animals, two great conduits; one coming down from the head and upper extremities, the other coming up from the trunk and inferior extremities. These conduits meet directly end to end, so as to form but one trunk, which opens into the heart by a gap at the side.

The blood thus returned is of course altered, in the first place by having parted with a great deal of matter for the repair and growth of the different organs, and secondly, by being loaded with all the useless particles which the absorbents have taken up. In order, then, that it may be fitted for circulation again, it must receive considerable additions, and it must cast off considerable impurities. The former are supplied by the lacteals, but the latter process requires a different set of vessels, endowed with other powers.

One of the chief impurities which the blood receives from the absorbents is carbon or charcoal. To rid it of this, a part, and in the more perfect animals the whole of the blood, is made to pass through an organ where the vessels come almost into contact with the element in which the animal lives, as the water in fishes, and the air in birds and man. Both these elements contain oxygen, or vital air, and by some hidden means the carbon of the blood, being supposed by most to unite with this vital air, escapes through the thin coats of the vessels in the form of carbonic acid gas, the same gas that rises from fermented liquors, soda water, &c. Thus we see some animals breathing water, and others air. The former generally have the breathing organs placed externally; they are termed *branchiæ* or *gills;* in the latter, they are situated within the body, and are called *lungs*, or *lights*. The function performed by these organs is called *respiration*.

It is believed by many physiologists, that nature, always unwilling to perform any useless labor, and anxious to effect as many operations as possible with a very few materials, has so ordered the laws of respiration that it shall preserve the warmth of the animal at the same time that it purifies the blood. While the blood is acted upon by the atmosphere in the lungs, or by the water in the gills, it is supposed to absorb a great quantity of heat; and as it flows toward every part of the body, undergoing a gradual change, it is thought to throw out this heat, and thus to keep every part at its proper temperature.

The effects of respiration are not sufficient to remove all the impurities of the blood, and therefore a number of curious organs called *glands* are provided, some of which aid in separat-

ing many of these impurities, each gland furnishing its own peculiar fluid, which it pours out either into the bowels or into the skin. The product of many of these glands is made useful for various purposes before it is thrown off from the body; thus the liver, the largest of the glands, forms the *bile*, which is the natural purgative, producing, when healthy, regular and comfortable stools; and when diseased, occasioning costiveness, or bowel complaints: the pancreas and the glands about the mouth pour out the *spittle*, which assists digestion. These useful fluids are called *secretions;* but those which are ejected, like the urine, without fulfilling any important purpose, are called *excretions*..

From what has been said, it is obvious that the motions necessary to maintain life, even in very simple animals, are numerous and complex. The stomach and intestines must receive and digest food; the lacteals must take up the nutritious part of the food and carry it to the blood; the arteries must convey this blood to the different organs; the capillaries must supply the growth and waste of those organs; the absorbents must aid the capillaries in taking away the worn out and useless parts, to mingle them with the blood in the veins; these vessels must convey the blood back to the heart, which must then pass it to the lungs, to be deprived of some of its impurities, and to enable it to sustain the heat of the body. In addition to all this, the glands must assist in purifying the blood, or they must furnish fluids to aid in digestion and other functions. or to purge away those useless remains of the food which cannot be digested. So many different motions all dependent on each other, would necessarily produce continual confusion, by acting irregularly and to cross purposes, if they had not some common bond of union by which they can mutually inform each other, as it were, of their several wants and actions. This bond of union is furnished by the *nerves*.

In the more simple animals, we find only a few nervous fibres, running in different directions, with here and there little knots called *ganglions*, joining several fibres together. When any impression is made upon one of these fibres, it is instantly communicated to the parts with which it is connected, and calls them into action. If the fibre is united with others, or with one or more of the little knots just mentioned, they are also called into action, and several different parts are then put in motion at once. Thus when food enters the stomach, its nerves receive the impression and cause the capillaries of that organ to dilate, in order to receive the blood required to carry on the process of digestion; they also give notice to the heart, which, if necessary, acts with more force in hastening the circulation, and the capillaries of the skin contract, and drive the blood from the

surface toward the bowels. This is the cause of the slight chill and consequent fever so often felt during and after a hearty dinner. The animal, however, remains unconscious of all this hurry of business within, and the nerves which are the messengers and agents of the manufactory are called the *nerves of organic life.* They are altogether independent of the will, and are found in animals supposed to have no brain.

In beings of a higher order, that are obliged to choose their food with judgment and to travel far in search of it, other nerves are required to enable them to recognize its presence; these are the *nerves of sensation.* There must also be a *brain*, to enable the animal to judge of its impressions, and to perceive its wants, and another system of nerves is required to pass from the brain to the different muscles, by which the former may direct the latter; these are the *nerves of voluntary motion.* All these several systems, though in some degree independent, are connected together by the brain and the little knots or ganglions, so that they mutually influence each other.

Finally, to enclose and protect this multiform and delicate structure, there is a coat of condensed cellular tissue covering the whole body, and called the *true skin*, over which is spread a thin layer of horny matter, called the *cuticle*, or scarf skin. This cuticle is totally insensible, and forms a mere crust which protects the delicate and exquisitely sensitive surface of the true skin. The horns, nails, hairs, spines, shells, and crusty coverings of various animals, are all classed properly with the cuticle, being either excrescences of, or substitutes for, that membrane.

Each of the parts of an animal that have now been enumerated may be found even in a common snail, or in the meanest of the reptiles; but as we ascend in the scale of nature, every system of organs is observed to become more and more complex in structure, and capable of actions more and more various.

Man, the most perfect of animals, not only requires the whole of this complex apparatus, but his brain also contains systems of nervous fibres, for the exercise of the higher instincts, moral feelings, and reasoning faculties. He is at first nothing but a little mass of cellular tissue; but as the infant in the mother increases in size, one organ is added after another, nearly in the order described, and many of his parts do not reach their full developement until he approaches middle life.

SKELETON,

In *anatomy*, is the assemblage and combination of all the bones in the body, except the os hyoides; it constitutes the basis or ground-work of the animal frame, being the point of support and union for all the other organs. Its component parts form a series of levers, of which the muscles are the moving powers; thus the skeleton comprehends one division of the moving organs. Its constituent pieces in some cases form cavities, as those of the head, chest, and pelvis, which contain the important internal organs, and protect them from external force.

The connexions of the different pieces of the skeleton are called *joints*, and differ very considerably from each other—some of them admitting of no motion, some an inconsiderable motion, and others allowing them to move freely, either in certain directions or in every way. The word *skeleton* denoting the bony fabric in its united state, of course includes the joints, or media of union; and in this respect we distinguish two kinds of skeletons. A *natural* skeleton, is that in which the bones are all joined by their natural connexions; that is, the articular ends are covered by their cartilaginous strata, tied together by ligaments, and enveloped by synovial membranes: in this sense the skeleton includes, besides the bony system, the accessory structures of cartilage, ligament, and synovial membranes. When all the soft parts have been allowed to putrefy and rot, and the separated bones, after being cleaned and dried, have been joined again by wires, &c., so as to be reunited artificially in their former order, an *artificial* skeleton is formed. In the spine and the ribs, the places of the cartilages which are lost in cleaning the bones, are supplied by portions of leather, cork, or other materials.

The latter, exhibiting merely the assemblage of the dried bones, is applicable to the study of osteology only in the mechanical points of figure, size, &c.; and although extremely useful to the anatomist and surgeon, by representing the parts in their natural connexion and relations, is less convenient than the separate bones for the study of many points, particularly the articular ends of the bones.

For the formation of artificial skeletons, the bones are deprived of their soft parts, either by boiling or by maceration in water. The boiling must be continued until the tendons, ligaments, periosteum, &c., are so loosened as to admit of being easily detached. The bony texture acquires in this method a dirty and greasy appearance, which cannot be entirely got rid of by any after process. For the purpose of maceration, the bones with the flesh, &c., roughly cut off, must be left in the same water

for some months; the soft parts will then fall off, and leave the bones of a much better color, and freer from grease, than when they have been boiled. Exposure to the air, and frequently wetting them, will make them beautifully white after they have been well macerated. Their color may be often much improved by exposure to chlorine (oxymuriatic gas). The bones which possess large medullary cavities should be bored at the articular ends, to get out the fatty substance.

Emaciated and particularly anasarcous subjects, are the best for making skeletons; because there is no fat in the bones, and they consequently continue dry and clean, when they have been originally well prepared. Persons dying in good health, or from sudden attacks, have so much adipous matter in the interior of their bones, that they continue greasy, particularly at the articular ends, whatever pains may be taken to clean them.

In natural skeletons, the cartilages, ligaments, and synovial membranes being all left, the joints possess their natural mobility. But in order to keep them in this state, they must be preserved in spirits, or some other fluid capable of preventing the putrefaction of the soft parts. This is particularly necessary with the skeletons of young subjects, which are in a great part cartilaginous. When a natural skeleton is dried, the soft parts shrink and are shrivelled up; the cartilages become contracted, and thus the natural figure is greatly impaired. The contraction of the cartilages diminishes the height by an inch or more.

So long as the bones are composed of separate pieces, and have more or less cartilage in their structure, the osseous system can only be studied in natural skeletons; but when the ossification is complete, artificial skeletons are preferable.

The bones, being the levers by which the motions of the body are performed, have the muscles or moving powers fixed to them. But as they are subservient, in the construction of our frame, to other purposes besides those of motion, there are some bones, though very few, to which no muscles are attached; such are the incus in the ear, the ethmoid and inferior turbinated bones, and some bones of the carpus.

Although the form of the bones is variously modified, according to the figure of the parts in which they are placed, or to their destinations, they may be classed under the three divisions of broad or flat bones, cylindrical bones, and short bones. The broad bones represent flat shells, and consist of an inner stratum of reticular or spongy bony substance, which is covered on its surfaces with thicker or thinner plates of compact bony matter. The cylindrical, or long bones, form long shafts, expanded at their extremities into thicker heads, and containing a

medullary cavity internally. The short bones are such as are nearly equal in their length, breadth, and thickness; variously shaped, according to their situations and offices, and consist of the loose spongy texture, covered by a thin rind of compact bone.

The long bones belong in general to the locomotive apparatus, where they form levers, moved by the muscles in various directions. They are all placed in the limbs, where they form a central column, movable in various directions. They diminish in length and increase in number, successively from above downwards, from the humerus and femur to the phalanges of the fingers and toes. Hence the upper part of the limbs is characterized by extent of motion, the lower by multiplicity and variety of movements.

The broad bones have not much to do with locomotion, except as they afford extensive surfaces for the attachment of muscles. They compose cavities, such as those of the cranium and pelvis, for which their form is well adapted. Several are united to form one cavity, and this circumstance adds to the solidity of the structure, as the effect of external force is lost in the joints. They are generally concave and convex on their two surfaces.

The short bones are found in parts which unite mobility and solidity, as the vertebral column, the carpus and tarsus. They are always of inconsiderable size, and therefore are found in large number in the parts which they compose. These parts are strong, because external force is lost in the articulations; they are movable, because the combinations of several small motions produce a considerable effect.

The skeleton is divided into the head, trunk, and extremities or limbs. As almost all the bones are formed originally of more than one piece, which separate portions of osseous matter gradually come together, and are ultimately consolidated, the number of distinct pieces of bone belonging to the skeleton is different at different ages. The following is the number of bones when the ossification is complete, that is, about the twentieth year.

I. In the Head, consisting of the *cranium*, and the Face, the former is made up of

1 or 2 ossa frontis,
2 ossa parietalia,
1 os sphenobasilare, or spheno-occipitale,
2 ossa temporum,
2 mallei,
2 incudes,
2 stapedes, and 1 os ethmoideum.

The latter of

2 ossa maxillaria superiora,

2 ossa palatina,
2 ossa malarum, or zygomatica,
2 ossa nasi,
2 ossa lacrymalia,
2 ossa turbinata inferiora,
1 vomer,
1 maxilla inferior,
32 teeth.

The whole amount of bones in the head is 59 or 60. The five pieces of the os hyoides added to these, make 64 or 65.

II. The TRUNK, comprehending the spine, chest and pelvis, consists of

7 cervical, } vertebræ,
12 dorsal, } vertebræ,
5 lumbar, } vertebræ,
2 or 3 bones of the sternum,
24 ribs,
1 sacrum,
4 ossa coccygis,
2 ossa innominata.

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57 or 58

III. The EXTREMITIES.

The upper contain,

In the shoulders,	2 clavicles,
	2 scapulæ.
In the arms,	2 humeri.
In the fore-arms,	2 radii,
	2 ulnæ.
In the wrists,	2 ossa navicularia, or scaphoidea,
	2 ossa lunaria,
	2 ossa cuneiformia,
	2 ossa pisiformia, or orbicularia,
	2 ossa trapezia, or multangula majora,
	2 ossa trapezoidea, or multangula minora,
	2 ossa capitata,
	2 ossa unciformia, or hamata.
In the metacarpi,	10 ossa metacarpi.
In the fingers,	10 first or metacarpal phalanges,
	8 middle or second phalanges,
	10 third or unguinal phalanges,
	8 sesamoid bones.
	72

The lower extremities contain,

In the thighs,	2	femora.
In the legs,	2	tibiæ,
	2	patellæ,,
	2	fibulæ.
In the tarsi,	2	astragali,
	2	calcanei, or ossa calcis,
	2	ossa navicularia,
	2	ossa cuneiformia magna,
	2	" " parva,
	2	" " media,
	2	ossa cuboidea.
In the metatarsi,	10	ossa metatarsi.
In the toes,	10	first or metatarsal phalanges,
	8	middle or second phalanges,
	10	third or unguinal phalanges,
	6	sesamoid bones.
	66	

The whole number of bones will be 259, or 261. There is frequently a small bone of the sesamoid kind in the tendon of the external head of the gastrocnemius; and a roundish bit in the hyo-thyroid ligament. If both these should exist, we must add 4 to the preceding number.

A complete dry natural skeleton of a male subject of the middle size weighs from 150 to 200 ounces; that of a female, from 100 to 160 ounces.

Of the bones just enumerated, the frontal, spheno-occipital, vomer, lower jaw, vertebræ, sacrum, coccyx, sternum, and os linguale medium, are single, (imparia,) and being placed on the middle line of the body, symmetrical; all the others are double, or in pairs, (paria,) each pair being composed of a right and left corresponding bone. Hence the structure of the whole skeleton is symmetrical; that is, if we imagine a perpendicular line to be drawn through the whole body, from before backwards, it will divide the skeleton into two corresponding halves, a right and left—the single bones having their right and left sides exactly alike.

This observation, however, of the symmetry of the skeleton, is not to be understood rigorously; since the right and left of the double bones, or the right and left sides of the single ones, are not accurately alike. The right or left bone, or the right or left side of a bone, may be longer or shorter, broader or narrower, &c., than the other. The vomer is generally bent to one side—the internal surface of the skull is seldom symmetrical. The last rib is often an inch longer on one side than on the

other. The sternum is seldom symmetrical; and the cartilages of the ribs are not fixed to it exactly opposite to each other. The articulations of the ribs with the spine often differ considerably on the two sides. But the symmetry of the external form is not disturbed by these differences. If the right side of a vertebra is more elevated than the left, the corresponding part of the neighboring bone, or of the intervertebral cartilage, is accommodated to the deviation, so that the perpendicular line of the spinal column is not impaired, &c.

The single bones may be regarded as the media of union of the two lateral halves which constitute the skeleton; they join together these two halves into one solid whole. In this respect there is a marked difference between the bones and the other organic instruments of locomotion, the muscles. The diaphragm is the only muscle placed on the median line, and its structure is not symmetrical; it belongs in a great measure to the internal or organic life, and corresponds, in its want of symmetry, to the arrangements of the internal organs. The skeleton, being the basis or point of support of the muscles, as well as of all the other organs, constitutes an entire aud firm fabric; an attribute which it derives from the single bones, which may be regarded as the key-stones of the building. The muscles, not contributing to the solidity of the animal structure, are not united into such a single and firm assemblage.

The observation which we have made of the bones in general, that they influence and determine the form of the soft parts, holds good more particularly of the whole skeleton. Its form, in all men, and in all stages of their life, corresponds so entirely to the configuration of their body, that an experienced eye would easily determine, from a tolerably preserved skeleton, not only the age and sex, but the growth and most striking characters of bodily formation of the individual to whom it had belonged. Hence it is not enough for an artist to know the muscles: he must begin with studying the skeleton. However numerous the differences of individual configuration in the human race, still retaining its general character and resemblance, accurate examination will show us not fewer diversities in the structure, form, size, greater or less elegance, and even greater or less fineness and firmness in the grain of the bone, in human skeletons, which still preserve the general character. Besides these endless individual traits, distinguishing each skeleton from others, we find very striking differences according to age and sex.

With respect to the former of these circumstances, skeletons have been divided into perfect and imperfect; the latter not very well chosen term being applied to fœtuses, to children, and subjects in whom the epiphyses are not yet consolidated with

the bodies of the bones, or converted into true apophyses; although, in relation to the rest of the structure, the bones are then as perfect as in the adult. The younger the subject, the more cartilage does the skeleton contain. Reckoning from the twentieth year backwards, the younger the subject the larger is the head, compared to the trunk and limbs; (the head is about one half of the body in the second month of utero-gestation; one fourth in the ninth month: one fifth at the age of three years; and one eighth when the growth is complete:) the smaller are the bones of the face, and the larger the organ of hearing, in comparison to the cranium; the larger are the fontanelles; the flatter is the lower part of the face; the larger the chest in relation to the pelvis; the shorter the limbs; the larger the clavicles; the smoother and flatter the broad bones, and the rounder the cylindrical bones.

The male and female skeletons differ, not only in the whole combination, or the general impression, from a comparative survey, but also in the form and properties of the individual parts. These differences, however, are not clearly perceptible, until some years have elapsed after birth. Soemmering enumerates the following as the characters of the female.

The female skeleton is smaller and slenderer in all parts than the male. The ratio of the head including the teeth to the rest of the bony structure, is greater than in the male; the numbers are as 1 to 6 in the former, 1 to 8 or 10 in the latter. The circumference of the female skull is larger on the first view, in skeletons of the same height. The skull is larger in proportion to the face; its foramina, the palatine arch, and the whole cavity of the mouth, are smaller. The whole thorax is shorter; larger above, as far as the fourth rib, narrower below; more movable, less conical; more convex in front: more distant from the pelvis, the interval between the last rib and the os innominatum being greater; less prominent anteriorly, so that when the trunk is supine, the symphysis pubis is the highest point in the female, the thorax in the male subject. Generally, the cartilages of the true ribs are longer in proportion to the bone. The vertebral canal is more capacious, and the lateral openings for the nerves are also larger. The spinous processes are less prominent; the sternum is shorter, ending at the plane of the fourth rib, while it reaches to the plane of the fifth in the male.

The loins are longer, and the angle between the last lumbar vertebra and the sacrum, constituting the promontory, is more acute.

All the diameters of the pelvis are greater; the cristæ and tuberosities of the ossa innominata further apart; the space be-

tween the ossa pubis wider, and the ligaments of the symphysis consequently broader, although shorter.

The sacrum is turned more backwards, so that the apex and the coccyx do not project so much into the pelvis. The acetabula are farther apart, and hence the unsteady gait of the sex: they are, however, nearer to the front of the pelvis, so that, when in the progress of pregnancy the centre of gravity is thrown more forwards, its equillibrium is better preserved.

The lower limbs form a more acute angle with the pelvis; the feet are smaller.

The shoulders are more slanting, and the articulations nearer together; the upper limbs are shorter, and the fingers more pointed.

Female bones are distinguished from the male by having fewer asperities, smaller spines and protuberances, shallower impressions, smaller articulations, and being, on the whole, smoother and more finely turned. The shaft or body of a cylindrical bone is more slender, in comparison to the articular ends; and hence the fact which was specified above, of the greater weight of the head in proportion to the rest of the skeleton.

The bones are not so hard in the female; they have, on the whole, a something peculiar—a feminine character— which is not easily described. Their extremities remain longer cartilaginous.

The frontal sinuses are smaller; the interval between them, or the glabella, less elevated; and the superciliary arches less prominent. All the bones of the face are more slender. The figure of the alveolar circle is more elliptical in both jaws; in man more circular. The teeth are smaller. The os hyoides more slender.

In the vertebræ, the bodies are longer, and more hollowed at the sides; the transverse processes are directed more backwards, so that the channels on each side of the spinous processes are deeper. The spinous processes are sharper pointed, shorter, and more slanting.

The ribs are more slender, and flatter; their margins are consequently sharper.

That the cartilages of the upper ribs are more frequently ossified; that those of the middle ribs are broader, and those of the lower longer, which has been asserted by some anatomists, does not seem clearly made out.

The first bone of the sternum is longer in comparison to the second. The latter is more than double the length of the former in the male skeleton; but in the female it is often not so much as double. It is also thicker, in comparison with the second bone, in the female. These differences are observable in the embryo.

The lumbar vertebræ are longer and more slender; the sacrum broader and more excavated.

The ossa coccygis are smaller, more moveable, and directed more forwards. Some have observed, that five of these bones are met with more frequently in the female than in the male.

The ossa innominata are broader, flatter, and more expanded horizontally. The angle formed between the descending ramus of the pubes and the symphysis is more open. The angle between the ossa pubis is acute in the male, but of 80 deg. to 90 deg. in the female, where it approaches much more to the figure of an arch.

The ischiatic tuberosities are larger and smoother. The space between the tuberosity and the acetabulum is smaller; the ischiatic notch more considerable; the foramen ovale larger; the notch for the tendon of the obturator externus less considerable.

The clavicles are less strongly curved, so that the scapulæ are thrown backwards; the male clavicles are more arched, and the shoulders therefore brought more forwards. In the male skeleton, the clavicles are inclined a little downwards, so as to form an obtuse angle with the sternum; while they form nearly a right angle in the female.

The female scapulæ are smaller, slenderer, flatter, and have acuter angles.

In the female, the thigh bones are bent more forwards; the neck forms a greater angle with the body; the internal condyle is larger, more prominent, and longer, in comparison with the external.

There are differences in some parts of the skeleton in the various races of mankind; that is, certain characters by which they can be distinguished from each other. The head is the part in which the strongest distinctive marks are observable.

The national differences in stature, in the size, length, and proportion of the limbs, &c., must be accompanied with corresponding variations in the bony fabric. But there are no peculiarities of form in the individual bones, no varieties in the configuration of processes, or articular heads or cavities, nor in their mutual adaptation.

The individual diversities of size and form must be attended with differences in the skeleton. The bones are sometimes longer, sometimes thicker. The head may be comparatively large or small; the shoulders broad or contracted; the thorax flat or prominent; the vertebral column more or less curved; the loins thick or slender; the thighs or legs, the fingers and toes, longer or shorter, &c.

Food seems to have no influence on the skeleton.

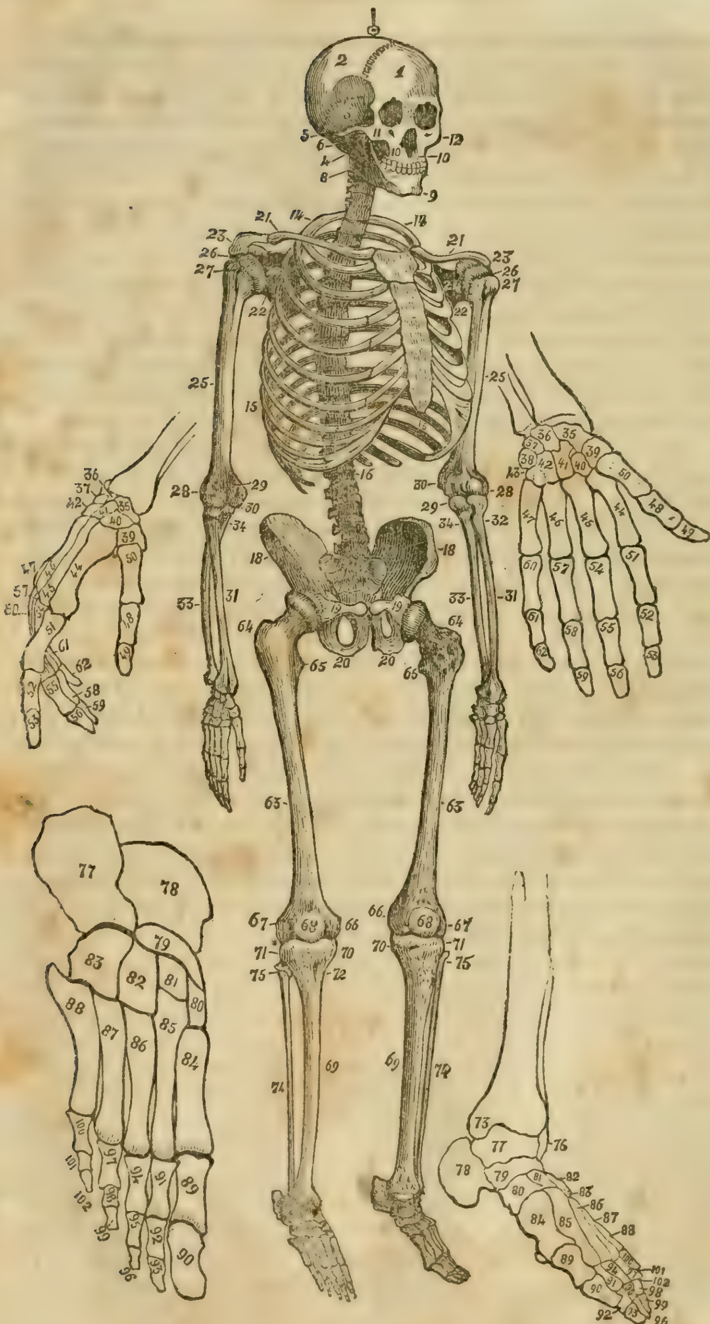
External causes have certainly, in some instances, ifluenced

particular parts in individuals; as the application of artificial pressure to the head of the newly born. The effect of analogous pressure in contracting the feet of the Chinese women, producing anchylosis of the articulations, and thus rendering these instruments of locomotion nearly useless, is well known.

But a more destructive process is that of the tight laced stays of females, who choose to fancy that beauty consists in having the chest large above and narrow below, although nature has reversed these proportions. The ribs are contracted; the inferior aperture of the chest narrowed; the liver, stomach, and other abdominal viscera, subjected to a severe and most injurious pressure, by this barbarous practice of civilized people. We have seen the figure of the thorax quite altered by this practice; the lower ribs being pushed in on the liver, and having left deep indentations in that organ.

The effect of artificial causes in modifying the form has, however, been much exaggerated; the round shape of the skull in the Turks being ascribed to their turbans, &c. A change is only to be effected by considerable and continued pressure on the bones in their growing state. These alterations are merely individual; they do not affect the race; as the offspring are born with the ordinary formation and characters of the species.

Note.—Calcined *human bones*, according to Berzelius, are composed, in 100 parts, of 81.9 phosphate of lime, 3 fluate of lime, 10 lime, 1.1 phosphate of magnesia, 2 soda, and 2 carbonic acid. 100 parts of bones by calcination are reduced to 63. Fourcroy and Vauquelin found the following to be the composition of 100 parts of ox bones:—51 solid gelatin, 37.7 phosphate of lime, 10 carbonate of lime, and 1.3 phosphate of magnesia; but Berzelius gives the following as their constituents: 33.3 cartilage, 55.35 phosphate of lime, 3 fluate of lime, 3.85 carbonate of lime, 2.05 phosphate of magnesia, and 2.45 soda, with a little common salt.



FRONT VIEW OF THE SKELETON.

The Head.

1 Os frontis.
2 Right os parietale or bregmatis.
3 Squamous portion of the right os temporis.
4 Mastoid process.
5 Meatus auditorius externus.
6 Condyloid process of inferior maxilla.
7 Coronoid proces
8 Angle } of infer.maxilla.
9 Symphysis
10 Right superior maxilla.
11 Right os malæ or jugale.
12 Left ditto.

The Trunk.

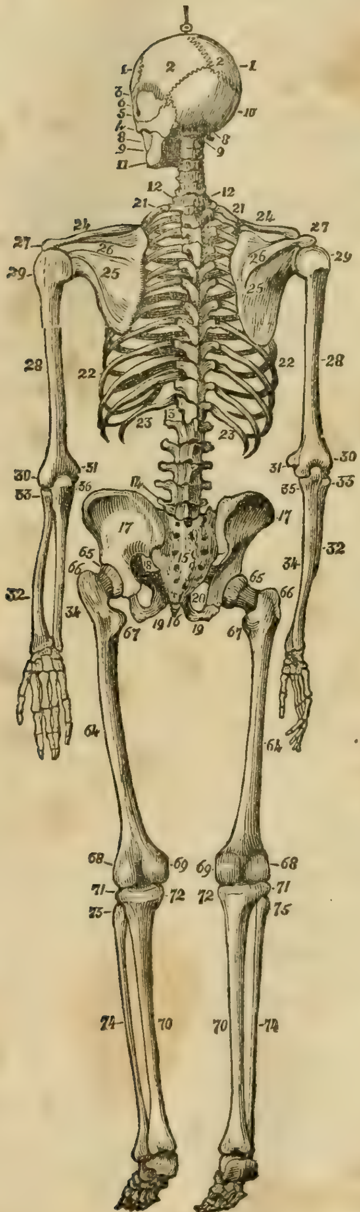
13 Seventh cervical vertebra.
14 First rib.
15 Eighth or first false rib.
16 First lumbar vertebra.
17 Sacrum.
18 Ileum.
19 Pubes.
20 Ischium.

Upper Extremities.

21 Clavicle.
22 Scapula.
23 Acromion.
24 Coracoid process.
25 Humerus.
26 Greater tuberosity.
27 Smaller ditto.
28 Eminence for the radius.
29 Trochlea.
30 Internal condyle.
31 Radius.
32 Tubercle of the radius.
33 Ulna.
34 Coronoid process of the ulna.
35 Os naviculare, or scaphoides.
36 Os lunare.
37 Os cuneiforme, or triquetrum.
38 Os pisiforme.
39 Os trapezium, or multangulum majus,
40 Os trapezoides, or multangulum minus.
41 Os capitatum.
42 Os unciforme, or hamatum.
43 Metacarpal bone of the thumb.
44 Do. do. of the fore finger.
45 Do. do, of the middle finger.
46 Do. do. of the ring finger
47 Do. do. of the little finger.
48 First phalanx
49 Second phalanx } of the thumb.
50 Sesamoid bones.
51 First phalanx
52 Second phalanx } of fore finger.
53 Third phalanx
54 First phalanx
55 Second phalanx } of middle finger.
56 Third phalanx
57 First phalanx
58 Second phalanx } of ring finger.
59 Third phalanx
60 First phalanx
61 Second phalanx } of little finger.
62 Third phalanx

Lower Extremities.

63 Thigh bone.
64 Trochanter major.
65 Trochanter minor.
66 Internal condyle.
67 External condyle.
68 Patella.
* Semilunar cartilage.
69 Tibia.
70 Internal condyle.
71 External condyle.
72 Tuberosity.
73 Internal malleolus.
74 Fibula.
75 Its head.
76 External malleolus.
77 Astragalus.
78 Os calcis.
79 Os naviculare.
80 Os cuneiforme primum.
81 Do. do. secundum.
82 Do. do. tertium.
83 Os cuboideum.
84 Mestatarsal bone of the great toe.
85 Do. do. of the second toe.
86 Do. do. of the third toe.
87 Do. do. of the fourth toe.
88 Do. do of the fifth toe.
89 First phalanx
90 Second phalanx } of the great toe.
91 First phalanx
92 Second phalanx } of the second toe.
93 Third phalanx
94 First phalanx
95 Second phalanx } of the third toe.
96 Third phalanx
97 First phalanx
98 Second phalanx } of the fourth toe.
99 Third phalanx
100 First phalanx
101 Second phalanx } of the fifth toe.
102 Third phalanx



BACK VIEW OF THE SKELETON.

Head.

1 Os parietale, or bregmatis.
2 Foramen parietale.
3 Malar process of the os frontis.
4 Os malæ.
5 Zygoma.
6 Squamous portion of the temporal bone.
7 Mastoid foramen.
8 Mastoid process.
9 Styloid process.
10 Os occipitis.
11 Lower jaw.

Trunk.

12 Seventh cervical vertebra.
13 Twelfth dorsal vertebra.
14 Fifth lumbar vertebra.
15 Sacrum.
16 Os coccygis.
17 Ileum.
18 Pubes.
19 Ischium.
20 Foramen ovale.
21 First rib.
22 Eighth or first false rib.
23 Twelfth rib.

Upper Extremities.

24 Clavicle.
25 Scapula.
26 Spine of the scapula.
27 Acromion.
28 Humerus.
29 Greater tuberosity.
30 External condyle.
31 Internal condyle.
32 Radius.
33 Its head.
34 Ulna.
35 Olecranon.
36 Os naviculare.
37 Os lunare.
38 Os cunieforme, or triquetrum.
39 Os pisiforme.
40 Os multangulum majus.
41 Os multangulum minus.
42 Os capitatum.
43 Os hamatum, or unciforme.
44 Metacarpal bone of the thumb.
45 Do. do. of the fore finger.
46 Do. do. of the middle finger.
47 Do. do. of the ring finger.
48 Do. do. of the little finger.
49 Sesamoid bone.
50 First phalanx
51 Second phalanx } of the thumb.
52 First phalanx
53 Second phalanx } of fore finger.
54 Third phalanx
55 First phalanx
56 Second phalanx } of middle finger.
57 Third phalanx
58 First phalanx
59 Second phalanx } of ring finger.
60 Third phalanx
61 First phalanx
62 Second phalanx } of little finger.
63 Third phalanx

Lower Extremities.

64 Thigh bone.
65 Its neck.
66 Trochanter major.
67 Trochanter minor.
68 External condyle.
69 Internal condyle.
* Semilunar cartilage.
70 Tibia.
71 Its external condyle.
72 Its internal condyle.
73 Internal malleolus.
74 Fibula.
75 Its head.
76 External malleolus.
77 Astragalus.
78 Os calcis.
79 Os cuboideum.
80 Os naviculare.
81 Os cuneiforme primum.
82 Do. do. secundum.
83 Do. do. tertium.
84 Metatarstal bone of the great toe.
85 Do. do. of the second toe.
86 Do. do. of the third toe.
87 Do. do. of the fourth toe.
88 Do. do. of the fifth toe.
89
90 } Sesamoid bones.
91 First phalanx of the great toe.
92 Do. do. of the second toe.
93 Do. do. of the third toe.
94 Second phalanx of the third toe.
95 First phalanx
96 Second phalanx } of the fourth toe.
97 Third phalanx
98 First phalanx
99 Second phalanx } of the fifth toe.
100 Third phalanx

DESCRIPTION OF THE TRUNK, INTERNAL ORGANS, AND EXTREMITIES.

In natural philosophy, all bodies are divided into ponderable and imponderable.

The first are those which may act upon several of our senses, and of which the existence is sufficiently established; of this kind are solids, fluids, and gases. The second are those which, in general, only act on one of our senses, the existence of which is by no means demonstrated, and which, perhaps, are only forces, or a modification of other bodies; such are caloric, light, the electric and magnetic fluids.

Ponderable bodies are endowed with common or general properties, and likewise with particular or secondary properties.

The general properties of bodies are—extent, divisibility, impenetrability, mobility. A ponderable body, of whatever kind, always presents these four properties combined. Secondary properties are variously distributed among different bodies, as hardness, porosity, elasticity, fluidity, &c. They constitute, by their combination with the general properties, the condition or state of bodies. It is by gaining or losing some of these secondary properties that bodies change their state; for instance, water may appear under the form of ice, of a fluid, or of vapor, although it is always the same body.

Bodies are *simple* or *compound.*

Simple bodies are rarely met with in nature; they are almost always the product of art, and we even name them simple, only because art has not arrived at their decomposition. At present, the bodies regarded as simple are the following: oxygen, chlorine, iodine, fluorine, sulphur, hydrogen, boracium, carbon, phosphorus, azote, silicium, zirconium, aluminum, yttrium, glucium, magnesium, calcium, strontium, barium, sodium, potassium, manganese, zinc, iron, tin, arsenic, molybdenum, chromium, tungsten, columbium, antimony, uranium, cerium, cobalt, titanium, bismuth, copper, tellurium, nickel, lead, mercury, osmium, silver, rhodium, palladium, gold, platinum, iridium, selenium, lithium, thorenum, wood, anium, cadmium.

Compound bodies occur every where; they form the mass of the globe, and of all the beings which are seen on its surface.

This diversity of bodies is extremely important; it divides them naturally into two classes; bodies the composition of which is constant are named brute, or gross, inert, inorganic; but those [the elements of which continually vary, are called living, organized bodies.

Brute and organized bodies differ from each other, in respect 1st of form—2d of composition—3d of the laws which regulate their changes of state.

The human body is divided by anatomists into the trunk and extremities, *i. e.* the head, and inferior and superior extremities, each of which have certain regions before any part is removed, by which the physician is enabled to direct the application of stimulants and the like, and the situation of diseases is better described.

The head is distinguished into the hairy part and the face. The former has five regions, viz. the crown of the head, or *vertex*—the fore part of the head, or *sinciput*—the hind part, or *occiput*—and the sides, *partes laterales capitis.* In the latter are distinguished, the region of the forehead, *frons*—temples, or *tempora*—the nose, or *nasus*—the eyes, or *oculi*—the mouth, or *os*—the cheeks, *buccæ*—the chin, or *mentum*—and the ears, or *aures.*

The trunk is distinguished into three principal parts—the neck, thorax, and abdomen. The neck is divided into the anterior region, or *pars antica*, in which, in men, is an eminence called *pomum Adami;* the posterior region is called *nucha colli;* and the lateral regions, *partes laterales colli.*

The thorax is distinguished into the anterior region, in which are the *sternum* and *mammæ*, and at the inferior part of which is a pit or hollow called *scrobiculus cordis;* a posterior region, called *dorsum;* and the sides, or *latera thoracis.*

The abdomen is distinguished into an anterior region, properly called the *abdomen;* a posterior region, called the loins, or *lumbi;* and lateral regions or flanks, called *latera abdominis.* The anterior region of the abdomen, being very extensive, is subdivided into the *epigastric*, *hypochondriac*, *umbilical*, and *hypogastric* regions. Immediately below the abdomen is the *mons veneris*, and at its sides the groins, or *inguina.* The space between the organs of generation and the *anus*, or fundament, is called the *perinæum.*

The superior extremity is distinguished into the shoulder, *summitas humeri*, under which is the arm-pit, called *axilla*, or *fovea axillaris;* the *brachium*, or arm; the *antebrachium*, or fore-arm, in which anteriorly is the bend of the arm, where the veins are generally opened, called *flexura antibrachii;* and posteriorly the elbow, called *angulus cubiti;* and the hand, in which are the *carpus*, or wrist, the back, or *dorsum manus*, and the palm, or *vola.*

The inferior extremity is divided into, 1. the region of the femur, in which is distinguished the *coxa*, or *regio-ischiadica*, forming the outer and superior part; 2. the leg, in which are the knee, or *genu*, the bend, or *cavum poplitis*, and the calf, or *sura;* 3. the foot, in which are the outer and inner ankle, or *malleotus externus* and *internus*, the back, or *dorsum*, and the sole, or *planta.*

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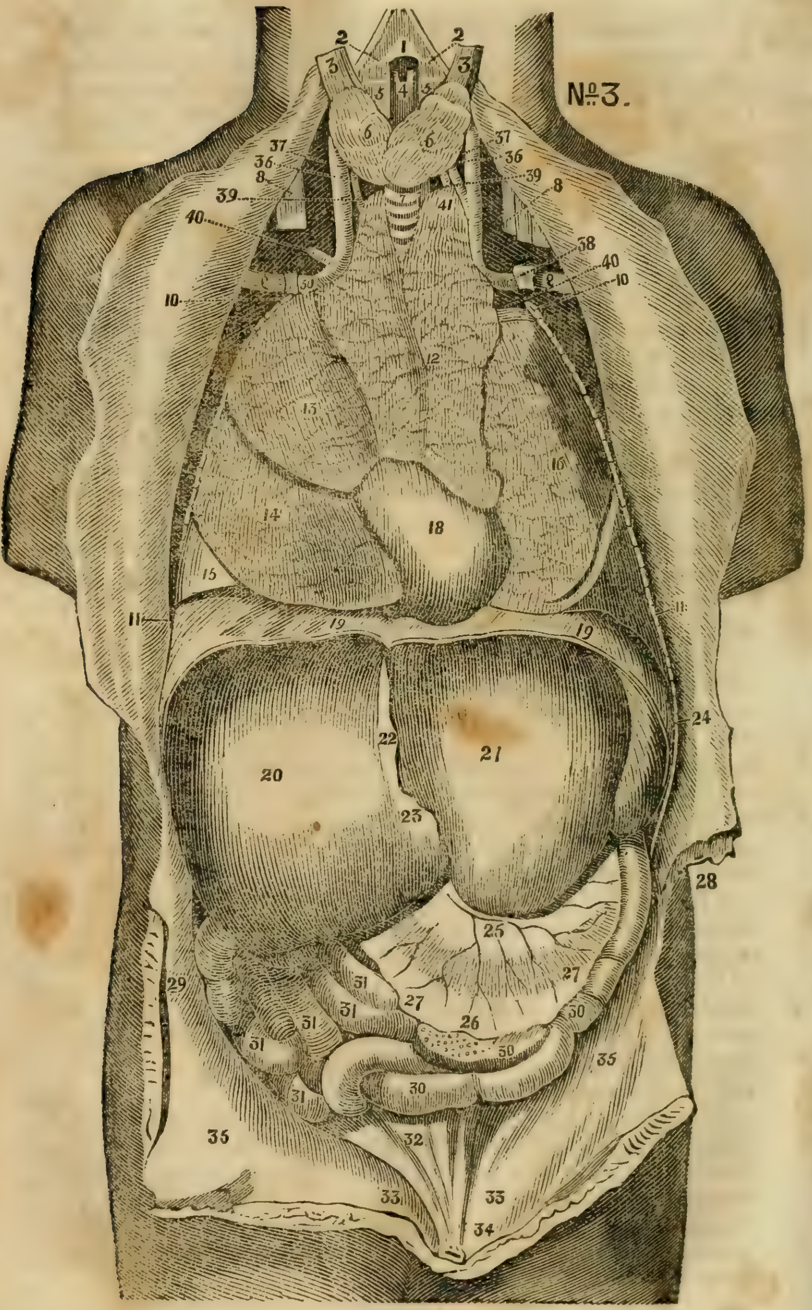

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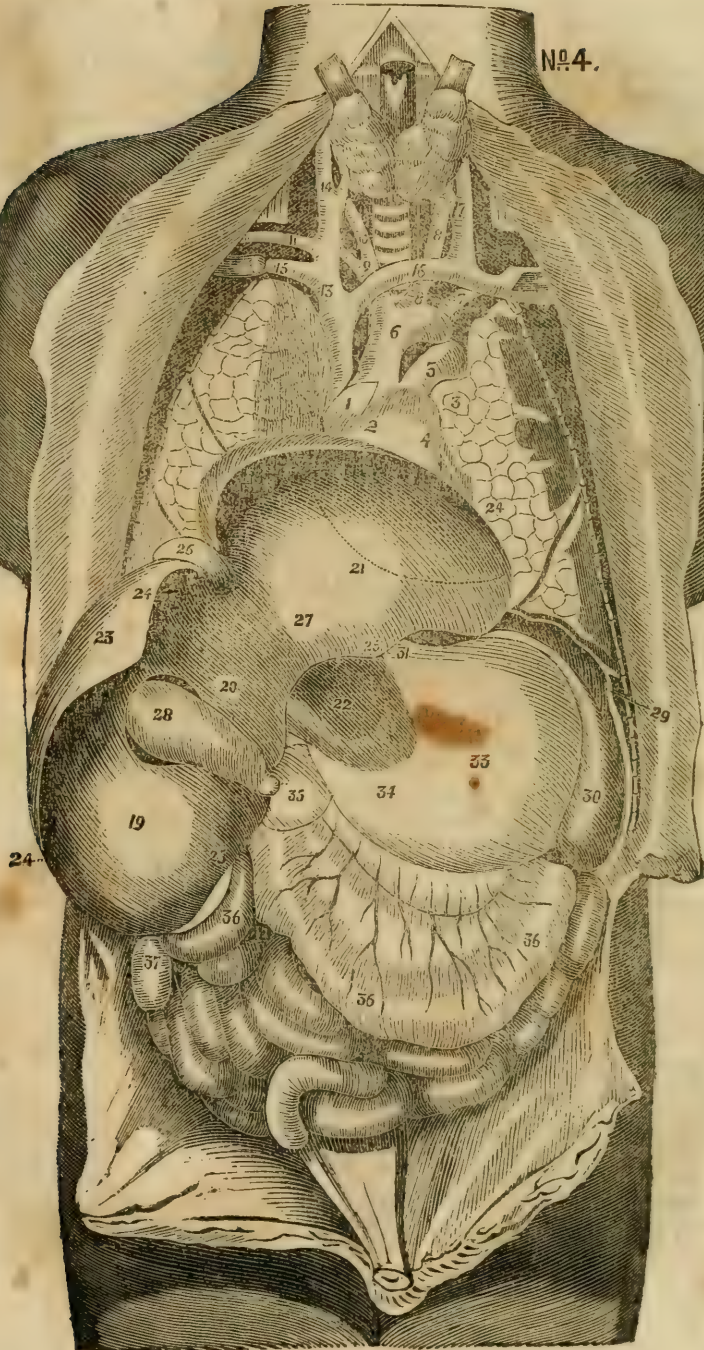
VISCERA,

In anatomy, is a term originally applied to the bowels or intestines, but now used indiscriminately for the organs contained in any cavity of the body—as the Heart, Lungs, Thymus, Stomach, Intestines, Liver, Spleen, Pancreas, Epiploon, and Generation.

DESCRIPTION OF PLATE 3,

Being a front view of the chest and abdomen in a newly born child; the sternum and neighboring part of the ribs, with the corresponding pleuræ, the front of the abdominal parietes and diaphragm, having been cut through and removed.

1 Os hyoides.
2 2 Portion of the sterno-hyoideus and omo-hyoideus muscles.
3 3 Portion of the sterno-thyroideus turned back.
4 Thyroid cartilage.
5 5 Hyo-thyroideus.
6 6 Thyroid gland. 7 Trachea.
8 8 Portion of the sterno-cleido mastoideus.
9 9 Clavicle. 10 10 First rib.
11 11 Ninth rib. 12 Thymus.
13–15 Right lung: 13, its superior lobe; 14, middle lobe; 15, inferior lobe.
16 17 Left lung: 16, the superior lobe; 17, the inferior lobe.
18 Pericardium. 19 19 Diaphragm.
20 21 Liver: 20, the right lobe; 21, the left lobe.
22 Suspensory ligament of the liver.
23 The umbilical vein turned back. 24 The spleen.
25 26 Great omentum: 25, its portion lying on the mesocolon; 26, loose portion.
27 27 Arch of the colon.
28 Left portion of the colon. 29 The right portion.
30 30 30 The jejunum, filled partly with meconium, partly with air.
31 31 31 The ileum.
32 Urinary bladder, with its fundus turned forwards.
33 33 Umbilical artery. 34 Urachus.
35 Internal surface of the peritoneum.
36 36 Internal jugular vein.
37 37 Thyroid vein.
38 38 Subclavian vein.
39 39 Common caroted artery.
40 40 Subclavian artery. 41 Œsophagus.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DESCRIPTION OF PLATE 4,

Exhibiting the same view as the last, except that the thymus and pericardium have been removed, and the liver turned up towards the right, so as to expose the stomach.

1—4 The heart: 1, appendix of the right auricle; 2 pulmonary ventricle; 3, appendix of the left auricle; 4, aortic ventricle. (The outline of the heart is marked by a dotted line on the surface of the liver.)
5 Pulmonary artery.
6 Aorta.
7 Left subclavian artery.
8 Left carotid.
9 Arteria innominata.
10 Right carotid.
11 Right subclavian artery.
12 Superior vena cava.
13 14 Right internal jugular vein: 13, portion in the chest; 14, portion in the neck.
15 Right subclavian vein.
16 17 Left internal jugular vein: 16, thoracic portion; 17, cervical portion.
18 Left subclavian vein.
19–22 Concave or under surface of the liver: 19, right lobe; 20, square portion; 21, left lobe; 22, lobulus spigelii, seen through the small omentum.
23 Part of the superior or convex surface.
24 24 24 Thin edge.
25 25 Thick edge.
26 Umbilical vein cut through and turned back.
27 The pons covering the notch of the umbilical vein.
28 Gall-bladder.
29 Part of the diaphragm.
30 Spleen.
31 Œsophagus entering the stomach.
32 Œsophagus in the neck.
33 Stomach.
34 Pylorus.
35 Duodenum.
36 36 36 Transverse portions of the colon.
37 Right portion of the colon. The other parts are the same as in the preceding plate.

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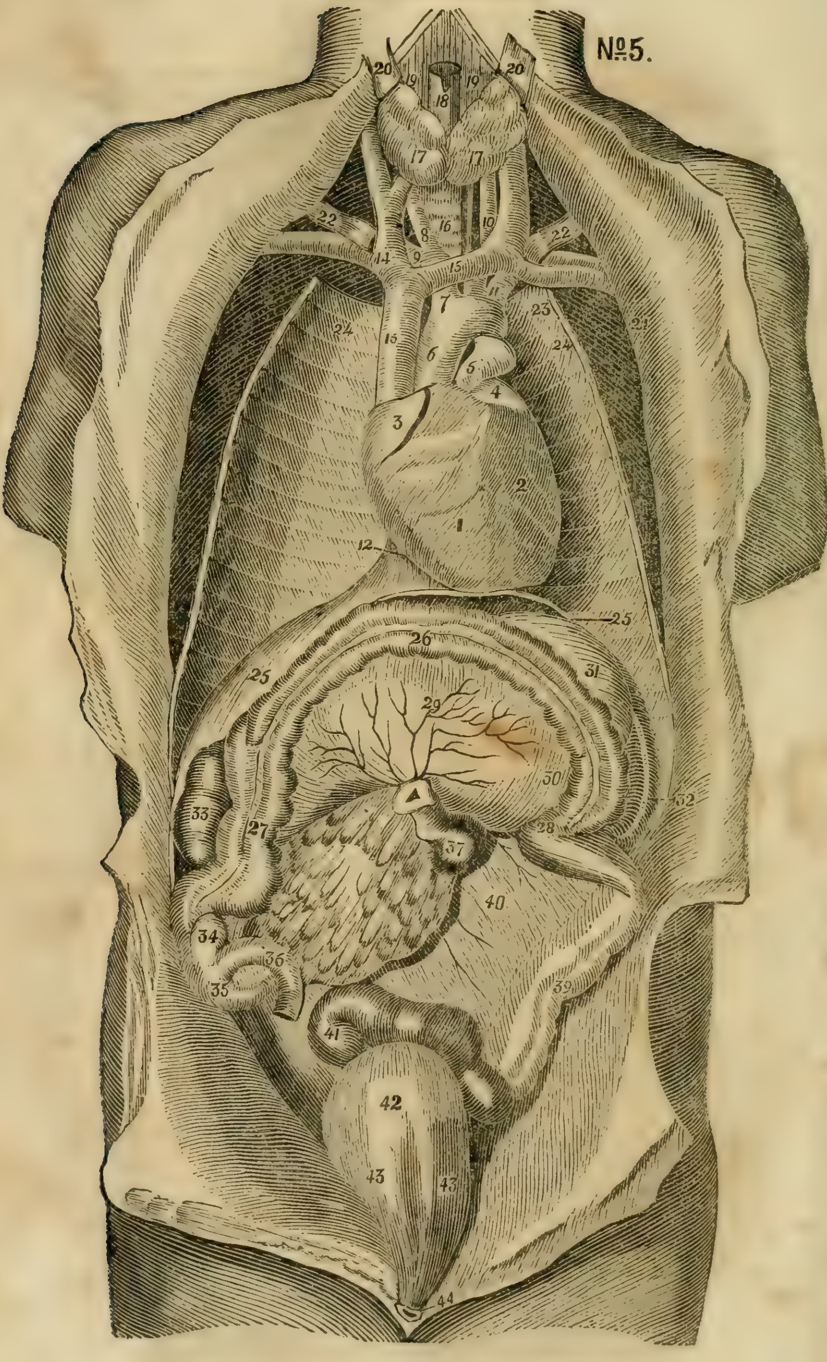
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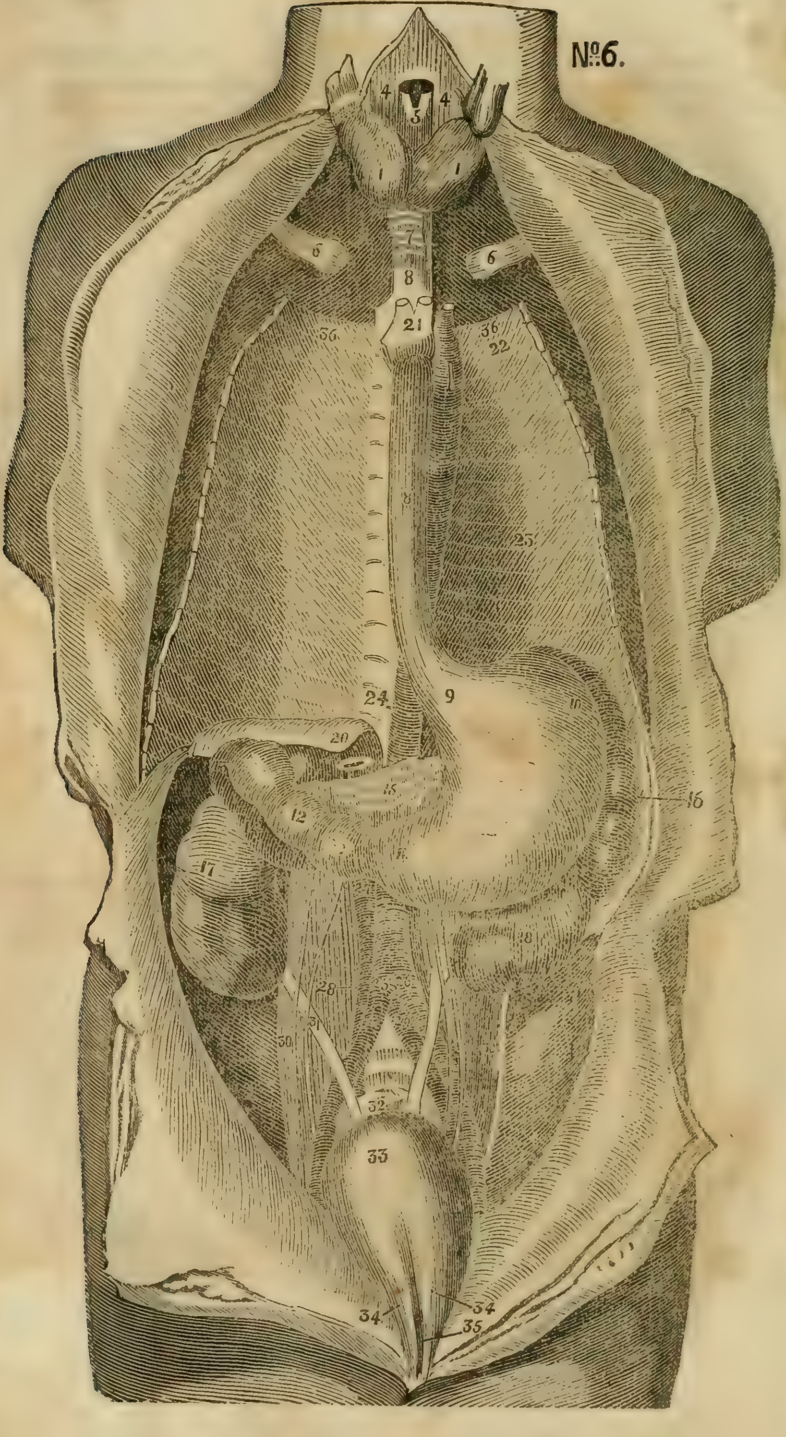
DESCRIPTION OF PLATE 5.

The heart and large vessels only are seen in the chest, the other parts having been removed. The small intestine is removed from the abdomen, and the arch of the colon is turned upwards.

1 Right or pulmonary ventricle of the heart.
2 Aortic or left ventricle.
3 Appendix of the right auricle.
4 Appendix of the left auricle.
5 Pulmonary artery.
6 Aorta.
7 Arteria innominata.
8 Right carotid.
9 Right subclavian.
10 Left carotid.
11 Left subclavian.
12 Inferior vena cava covered by the pericardium.
13 Superior vena cava.
14 Right internal jugular vein.
15 Left internal jugular vein.
16 Trachea.
17 17 Thyroid gland. 18 Thyroid cartilage.
19 19 Thyro-hoideus.
20 20 Sterno-thyroideus detached and turned back. (The sterno-hoideus is removed.)
21 21 Part of the sterno-cleido-mastoideus.
22 22 Clavicle.
23 23 First rib. 24 24 Second rib.
25 25 Cut edge of the diaphragm.
26 Arch of the colon.
27 Right portion of the colon.
28 Part of the left colon.
29 Transverse mesocolon.
30 Stomach seen obscurely through the mesocolon.
31 Left or great extremity of the stomach.
32 Spleen.
33 Right kidney.
34 Right portion of the colon.
35 Cæcum and appendix vermiformis.
36 End of the ileum.
37 Commencement of the jejunum.
38 Mesentery.
39 39 Sigmoid flexure of the colon.
40 Its mesocolon. 41 Rectum.
42 Urinary bladder, turned forwards and downwards.
43 43 Umbilical arteries. 44 Urachus.



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DESCRIPTION OF PLATE 6.

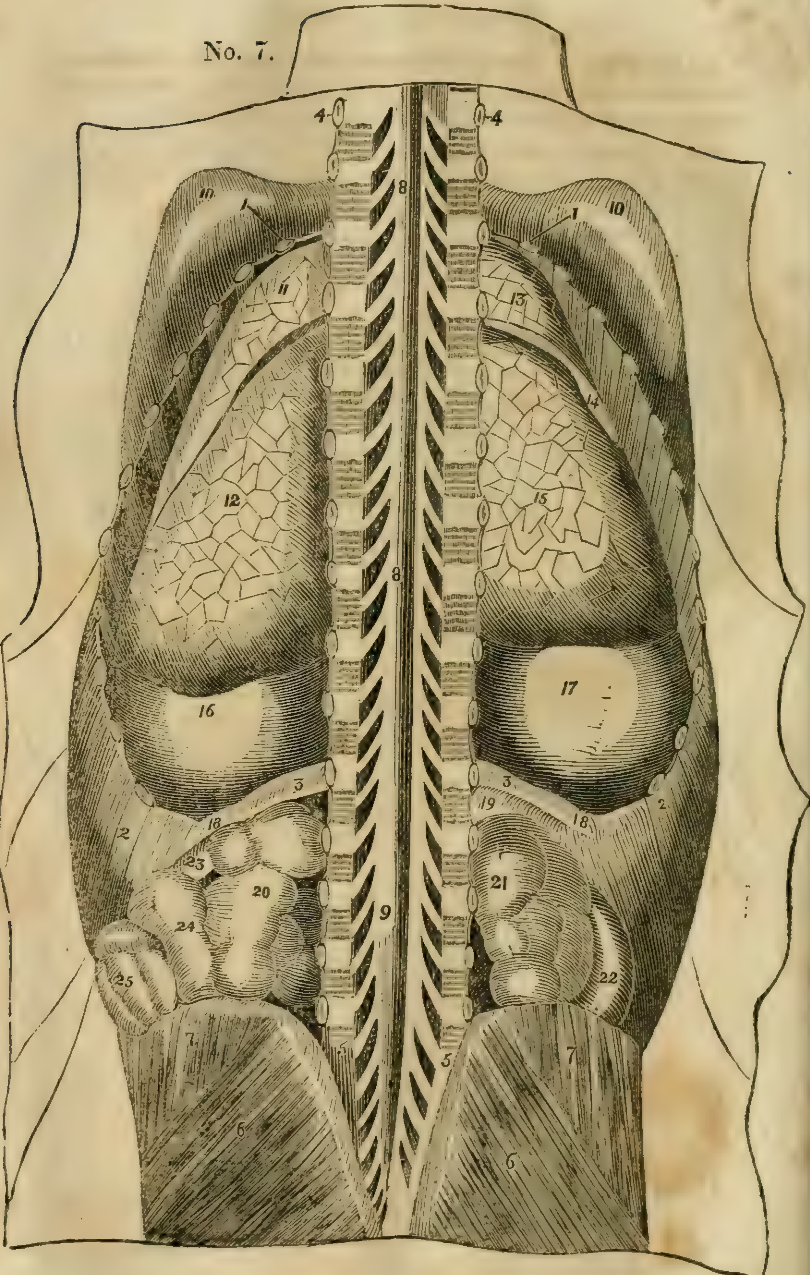
All the thoratic viscera are removed; also, the diaphragm and the small intestine, excepting the duodenum. The peritoneum is cleared from the kidney and larger vessels.

1 1 Thyroid gland.
2 2 Portion of the sterno-cleido-mastoideus.
3 3 Sterno-thyroideus detached and turned back. (The sterno-hyoideus is removed.)
4 4 Thyro-hyoideus.
5 Thyroid cartilage.
6 6 Clavicle. 7 Trachea.
8 8 Œsophagus; its longitudinal muscular fibres are exposed.
9–11 Stomach moderately distended.
9 The cardia. 10 The blind pouch. 11 Pylorus.
12–14 Duodenum: 12, the first curvature; 13, the second; 14, the third.
15 Pancreas. 16 Spleen.
17 Right kidney. 18 Left kidney.
19 Right renal capsule. 20 Portion of diaphragm.
21 Arch of the aorta with its three great branches.

See plate 3, No. 7, 10, 11.

22 Canalis arteriosus.
23 Descending thoracic aorta.
24 Descending abdominal aorta.
25 Right iliac artery. 26 Left iliac artery.
30 30 Spermatic artery and vein. 31 31 Ureter.
32 The cut orifice of the rectum.
33 Urinary bladder turned down.
34 34 Umbilical artery.
35 Urachus. 36 36 First rib.

No. 7.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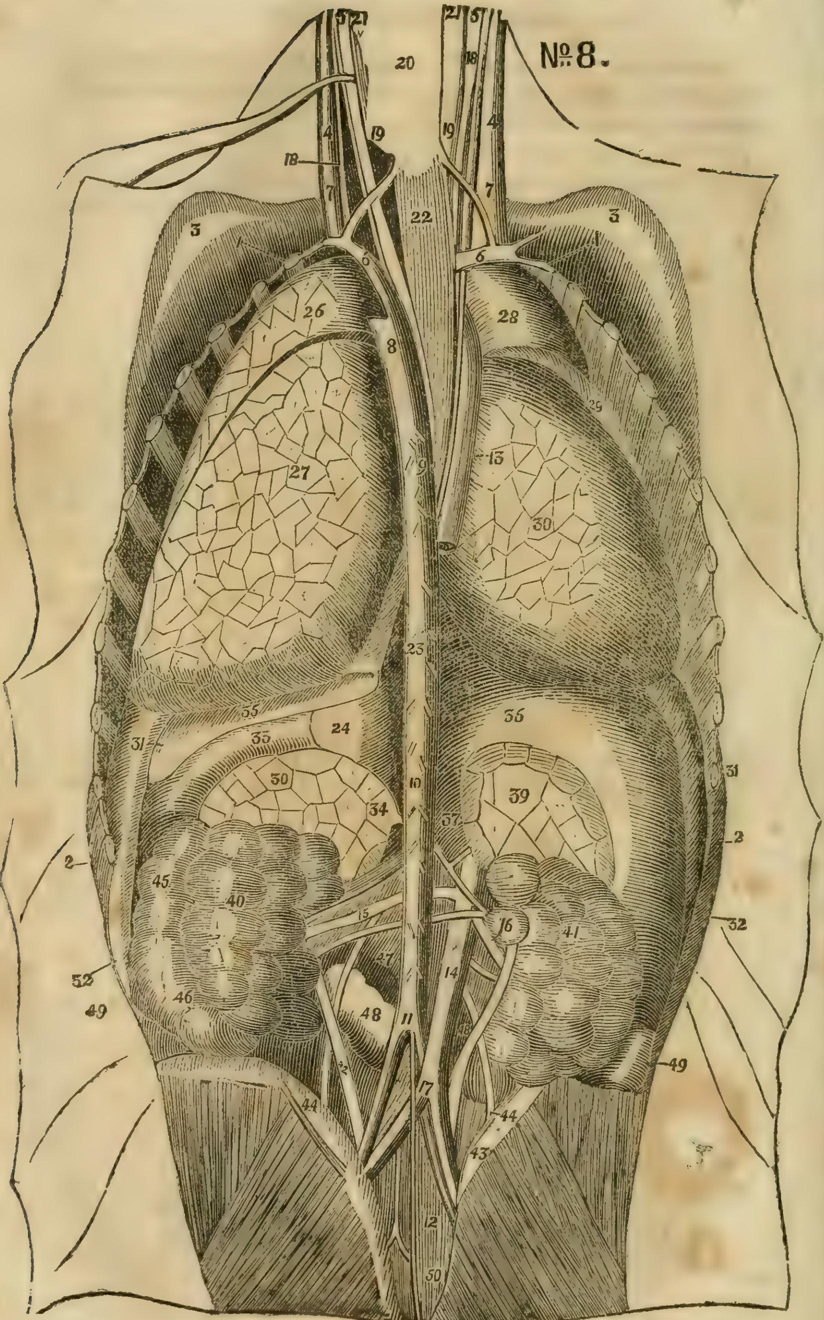
DESCRIPTION OF PLATE 7.

View of the thoracic and abdominal viscera from behind.—The muscles of the neck and back, the back of the ribs and the spinous processes of the vertabræ are removed.

1 1 First rib. 2 2 Eleventh rib.
3 3 Twelfth rib, with the diaphragm and abdominal muscles still attached. The ribs are gently drawn aside, to expose the lungs.
4 4 Sixth cervical vertebra. 5 5 Sacrum.
6 6 Gluteus maximus. 7 7 Gluteus medius.
8 8 8 The vertebral theca of the dura mater.
9 The same, covering the cauda equina.
10 10 The scapulæ a little drawn aside.
11 12 The left lung: 11, superior lobe; 12, inferior lobe.
13–15 Right lung: 13, superior lobe; 14, middle lobe; 15, inferior lobe.
16–18 Diaphragm: 16, covering the left lobe of the liver, stomach and spleen; 17, covering the right lobe; 18 18, attached to the twelfth rib.
19 Right renal capsule.
20 Left kidney. 21 Right kidney.
22 Inferior surface of the right lobe of the liver.
23 Left part of the colon.
24 Sigmoid flexure of the colon.
25 Portion of the ileum.

No. 8.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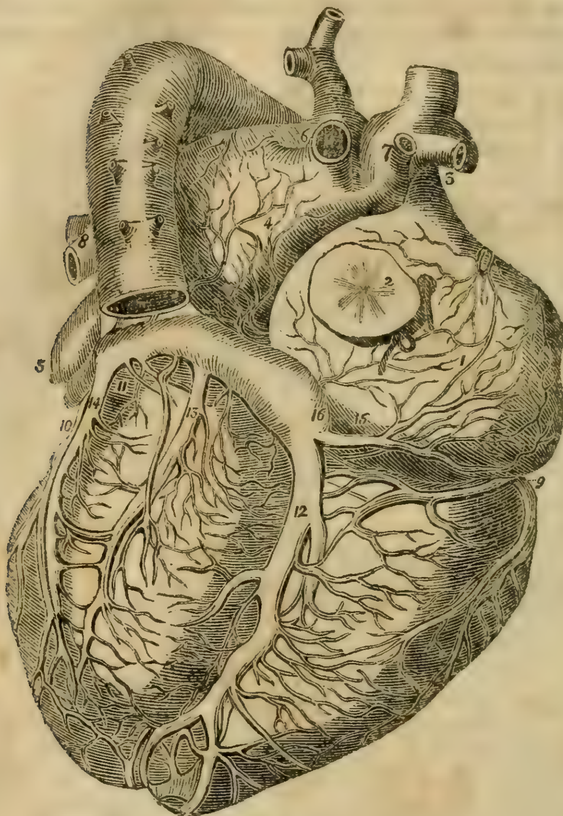
DESCRIPTION OF PLATE 8.

View of the thoracic and abdominal viscera from behind—the vertebral column, together with part of the os innominatum, being removed.

1 1 First rib. 2 2 Eleventh rib.
3 3 Scapula drawn aside.
4 4 Internal jugular vein.
5 5 Common carotid artery.
6 6 Subclavian artery.
7 7 Inferior thyroid artery.
8 Part of the aortic arch.
9–10 Descending aorta: 9, thoracic; 10, abdominal.
11 Division of the aorta into the common iliacs.
12 Midddle sacral artery. The intercostal, renal and lumbar arteries are not numbered.
13 Vena azygos cut off.
14 Inferior vena cava. 15 Left renal vein.
16 Right renal vein, double in this subject.
17 Union of the iliac veins to form the inferior cava.
18 18 Par vagum
19 19 Thyroid gland; the blood-vessels are drawn aside by a hook on the left side.
20 Lower part of the pharynx.
21 21 Thyroid cartilage. 22 Œsophagus.
23 Œsophagus entering the stomach.
24 Part of the stomach.
26 27 Superior and inferior lobes of the left lung.
28 29 30 Superior, middle, and inferior lobes of the right lung.
31 31 31 Diaphragm. 32 32 Abdominal muscles.
33 Spleen. 34 Part of the pancreas.
35–37 Left and right lobes and processus caudatus of the liver.
38 Left renal capsule. 39 Right renal capsule.
40 Left kidney. 41 Right kidney.
42 Left ureter. 43 Right ureter.
44 44 Spermatic vessels.
45 Left portion of the colon.
46 Sigmoid flexure.
47 Part of the jejunum seen through the peritoneum.
48 Rectum. 49 Portion of the ilium.

No. 9.—FIRST VIEW OF THE HEART.

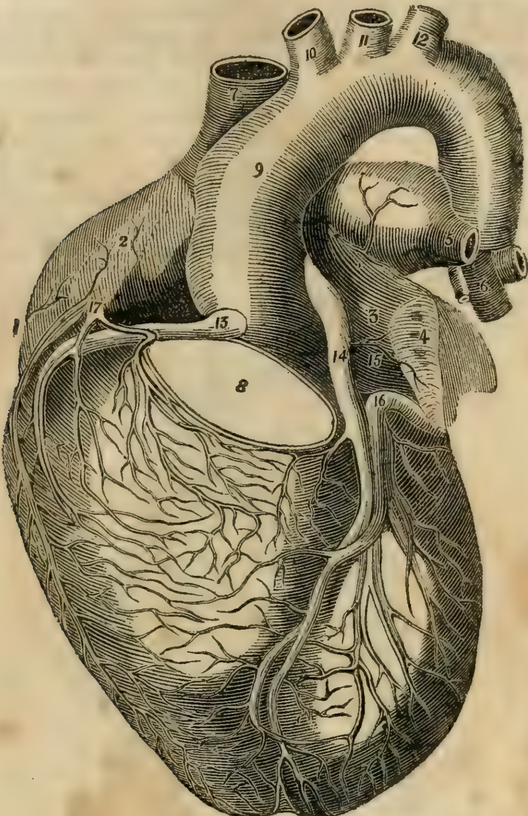


DESCRIPTION OF THE PLATE.

(The convex or superior surface.)

1 Right auricle. 2 Its appendix.
3 Left auricle. 4 Its appendix.
5 6 Left pulmonary veins. 7 Superior vena cava.
8 Place from which the pulmonary artery has been cut off.
9 Aorta. 10 Arteria innominata.
11 Left carotid artery. 12 Left subclavian artery.
13 Right or inferior coronary artery.
14 Left or superior coronary artery.
16 Anterior branch of the great coronary vein.

No. 10.—SECOND VIEW OF THE HEART.



DESCRIPTION OF THE PLATE.

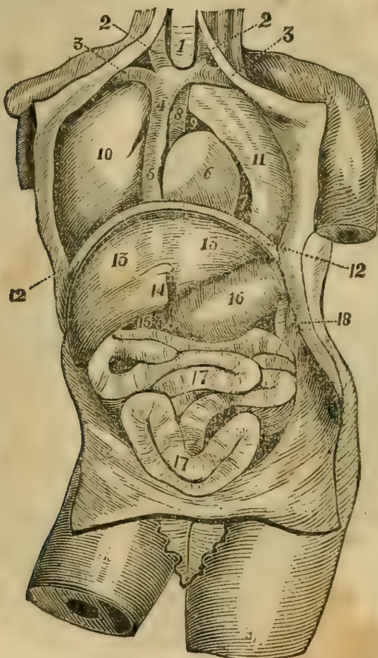
(The heart and blood-vessels seen on the inferior or flat surface.)

1 Right auricle.
2 Inferior vena cava cut off and tied.
3 Superior vena cava. 4 Left auricle. 5 Its appendix.
6 7 Right pulmonary veins.
8 One of the left pulmonary veins.
9 Right coronary artery.
10 Circumflex branch of the left coronary artery.
12 Great posterior branch of the great coronary vein.
13 14 Smaller posterior branches.
15 Small branch from the right auricle.
16 Trunk of the great coronary vein ending in the right auricle.
17 A small vein of the heart opening into the right auricle.

THE TRUNK.

This term, in anatomy, is applied to the body strictly so called. It is divided into the *thorax*, or chest—the *abdomen*, or belly—and the *pelvis*.

No. 11.



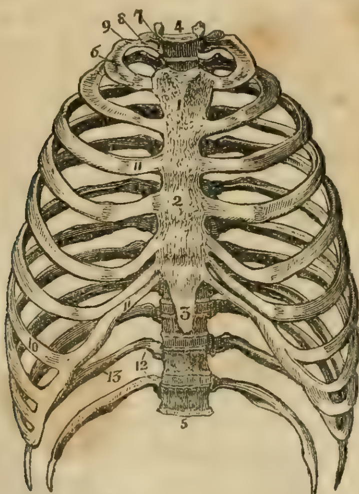
DESCRIPTION OF THE PLATE.

1 1 Thyroid cartilage.
2 2 Internal jugular veins coming from the head.
3 3 The principal veins from the arms, coming to join the great vein.
4 5 The great vein descending from the head and upper extremities, called the vena cava.
6 Right ventricle of the heart. 7 Left ventricle of do.
8 The great artery of the body called the aorta.
9 Aortic ventricle. 10 Right lung. 11 Left lung.
12 12 Diaphragm. 13 13 Right and left lobes of the liver.
14 Round ligament of the liver.
15 Gall-bladder. 16 Stomach.
17 17 Small intestines. 18 Spleen.

THORAX.

The thorax is the conical cavity, situated at the upper part of the trunk of the body; it is narrow above and broad below, and is bounded in *front* by the sternum, six superior costal cartilages, ribs, and intercostal muscles; *laterally*, by the ribs and intercostal muscles; and *behind*, by the same structures, and by the vertebral column, as low down as the upper border of the last rib and the first lumbar vertebra; *superiorly*, by the thoracic facia and first ribs; and *inferiorly* by the diaphragm. It is much deeper on the posterior than on the anterior wall, in consequence of the obliquity of the diaphragm, and contains the heart, enclosed in its pericardium, with the great vessels; the lungs, with their serous coverings, the pleuræ; the œsophagus; some important nerves; and, in the fœtus, the thymus gland.

NO. 12.—ANTERIOR VIEW OF THE THORAX.*



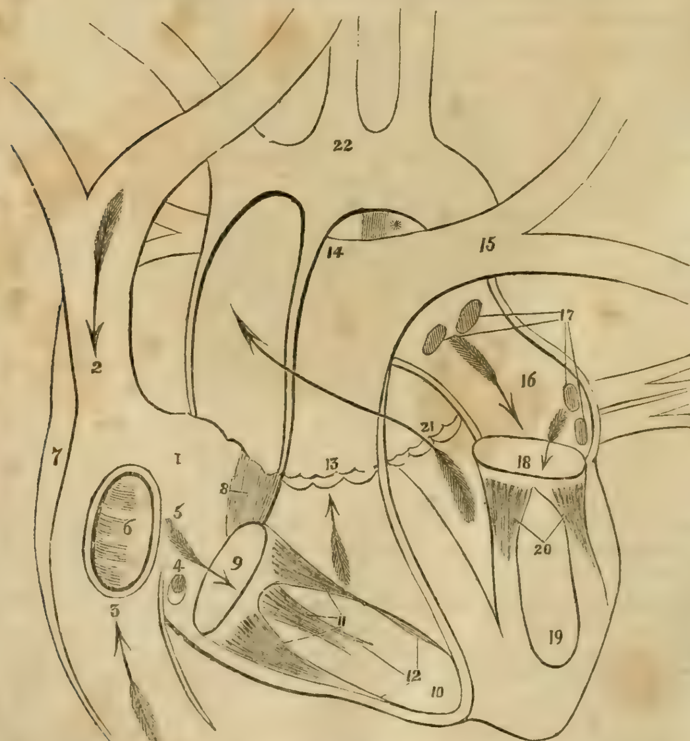
* Description of the plate.—1. The superior piece of the sternum. 2. The middle piece. 3. The inferior piece, or ensiform cartilage. 4. The first dorsal vertebra. 5. The last dorsal vertebra. 6. The first rib. 7. Its head. 8. Its neck, resting against the transverse process of the first dorsal vertebra. 9. Its tuberosity. 10. The seventh or last true rib. 11. The costal cartilages of the true ribs. 12. The two last false ribs—the floating ribs. 13. The groove along the lower border of a rib, for the lodgment of the intercostal vessels and nerve.

THE HEART.

The central organ of circulation, the heart, is situated between the two layers of pleura, which constitute the mediastinum, and is enclosed in a proper membrane, the pericardium.

Pericardium.—The pericardium is a fibro-serous membrane like the dura mater, and resembles that membrane in deriving its serous layer from the reflected serous membrane of the viscus which it encloses. It consists, therefore, of two layers, an external fibrous, and an internal serous. The *fibrous* layer is attached, above, to the great vessels at the root of the heart, where it is continuous with the thoracic facia; and below, to the tendinous portion of the diaphragm. The serous membrane invests the heart with the commencement of its great vessels, and is then reflected upon the internal surface of the fibrous layer.

NO. 13.—ANATOMY OF THE HEART.*



* Description of the plate.—1. The right auricle. 2. The entrance of the superior vena cava. 3. The entrance of the inferior cava. 4. the opening of the coronary vein, half closed by the coronary valve. 5. The Eusta-

The heart is placed obliquely in the chest, the *base* being directed upwards and backwards towards the right shoulder; the *apex* forwards, and to the left, points to the space between the fifth and sixth ribs, at about two or three inches from the sternum. Its under side is flattened, and rests upon the tendinous portion of the diaphragm; its upper side is rounded and convex, and formed principally by the right ventricle, and partly by the left. Surmounting the ventricles are the corresponding auricles, whose auricular appendages are directed forwards, and slightly overlap the root of the pulmonary artery. The pulmonary artery is the large anterior vessel at the root of the heart; it crosses obliquely the commencement of the aorta. The heart consists of two auricles and two ventricles, which are respectively named from their position, right and left. The right is the venous side of the heart; it receives into its auricle the venous blood from every part of the body, by the superior and inferior cavæ and coronary vein. From the auricle the blood passes into the ventricle, and from the ventricle, through the pulmonary artery, to the capillaries of the lungs. From these it is returned as arterial blood to the left auricle; from the left auricle it passes into the left ventricle; and from the left ventricle is carried through the aorta, to be distributed to every part of the body, and again returned to the heart by the veins. This constitutes the course of the *adult circulation.*

The heart is best studied *in situ.* If, however, it be removed from the body, it should be placed in the position indicated in the above description of its situation. A transverse incision should then be made along the ventricular margin of the right

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chian valve. 6. The fossa ovalis, surrounded by the annulus ovalis. 7. The tuberculum Loweri. 8. The muscular pectinati in the appendix auriculæ. 9. The auriculo-ventricular opening. 10. The cavity of the rignt ventricle. 11. The tricuspid valve, attached by the chordæ tendinæ to the carnæ columnæ (12). 13. The pulmonary artery, guarded at its commencement by three semilunar valves. 14. the right pulmonary artery, passing beneath the arch and behind the ascending aorta. 15. The left pulmonary artera, crossing in front of the descending aorta. The remains of the ductus arteriosus, acting as a ligiment between the pulmonary artery and arch of the aorta. The arrows mark the course of the venous blood through the right side of the heart. Entering the auricle by the superior and inferior cavæ, it passes through the auriculo-ventricular opening into the ventricle, and thence through the pulmonary artery to the lungs. 16. The left auricle. 17. The openings of the four pulmonary veins. 18. The auriculo-ventricular opening. 19. The left ventricle. 20. The mitral valve, attached by its chordæ tendinæ to two large columnæ carnæ, which project from the walls of the ventricle. 21. The com mencement and course of the ascending aorta behind the pulmonary artery, marked by an arrow. The entrance of the vessel is guarded by three semilunar valves. 22. The arch of the aorta. The comparative thickness of the two ventricles is shown in the diagram. The course of the pure blood through the left side of the heart is marked by arrows. The blood is brought from the lungs by the four pulmonary veins into the left auricle, and passes through the auriculo-ventricular opening into the left ventricle, from whence it is conveyed by the aorta to every part of the body.

auricle, from the appendix to its right border, and crossed by a perpendicular incision, carried from the side of the superior to the inferior cava. The blood must then be removed. Some fine specimens of white fibrin are frequently found with the coagula; occasionally they are yellow and gelatinous. This appearance deceived the older anatomists, who called these substances "polypus of the heart:" they are also frequently found in the right ventricle, and sometimes in the left cavities.

The *right auricle* is larger than the left, and is divided into a principal cavity or sinus, and an appendix auriculæ. The interior of the sinus presents for examination five openings; two valves, two relicts of fœtal structure, and two peculiarities in the proper structure of the auricle. They may be thus arranged:

Openings - - - -	Superior cava, Inferior cava, Coronary vein, Foramina Thebesii, Auriculo-ventricular opening.
Valves - - - - -	Eustachian valve, Coronary valve.
Relicts of fœtal structure	Annulus ovalis, Fossa ovalis.
Structure of the auricle	Tuberculum Loweri, Musculi pectinati.

The *superior cava* returns the blood from the upper half of the body, and opens into the upper and front part of the auricle.

The *inferior cava* returns the blood from the lower half of the body, and opens into the lower and posterior wall, close to the partition between the auricles (septum auricularum). The direction of these two vessels is such, that a stream forced through the superior cava would be directed towards the auriculo-ventricular opening. In like manner, a stream rushing upwards by the inferior cava, would force its current against the septum auricularum; this is the proper direction of the two currents during fœtal life.

The *coronary vein* returns the venous blood from the substance of the heart; it opens into the auricle between the inferior cava and the auriculo-ventricular opening, under cover of the coronary valve.

The *foramina Thebesii* are minute pore-like openings, by which the venous blood exhales directly from the muscular structure of the heart into the auricle, without entering the ve-

nous current. These openings are also found in the left auricle, and in the right and left ventricles.

The *auriculo-ventricular opening* is the large opening of communication between the auricle and ventricle.

The *Eustachian valve* is a part of the apparatus of fœtal circulation, and serves to direct the placental blood from the inferior cava, through the foramen ovale, into the left auricle. In the adult it is a mere vestige and imperfect, though sometimes it remains of large size. It is formed by a fold of the lining membrane of the auricle, containing some muscular fibres, is situated between the opening of the inferior cava and the auriculo-ventricular opening, and is generally connected with the coronary valve.

The *coronary valve* is a semilunar fold of the lining membrane, stretching across the mouth of the coronary vein, and preventing the reflux of the blood in the vein during the contraction of the auricle.

The *annulus ovalis* is situated on the septum auricularum, opposite the termination of the inferior cava. It is the rounded margin of the septum, which occupies the place of the foramen ovale of the fœtus.

The *fossa ovalis* is an oval depression corresponding with the foramen ovale in the fœtus. The opening is closed at birth by a thin valvular layer, which is continuous with the left margin of the annulus, and is frequently imperfect at its upper part. The depression or fossa in the right auricle results from this arrangement. There is no fossa ovalis in the left auricle.

The *tuberculum Loweri* is the portion of auricle intervening between the openings of the superior and inferior cava. Being thicker than the walls of the veins, it forms a projection, which was supposed by Lower to direct the blood from the superior cava into the auriculo-ventricular opening.

The *musculi pectinati* are small muscular columns situated in the appendix auriculæ. They are very numerous, and are arranged parallel with each other; hence their cognomen—"*pectinati*," like the teeth of a comb.

The *right ventricle* is triangular and three-sided in its form. Its anterior side is convex, and forms the larger proportion of the front of the heart. The inferior side is flat, and rests upon the diaphragm; and the inner side corresponds with the partition between the two ventricles, septum ventriculorum.

The right ventricle is to be laid open by making an incision parallel with, and a little to the right of, the middle line from the pulmonary artery in front, to the apex of the heart, and thence by the side of the middle line behind, to the auriculo-ventricular opening.

It contains, to be examined, two openings, the auriculo-ven-

tricular and that of the pulmonary artery: two apparatuses of valves, the tricuspid and semilunar; and a muscular and tendinous apparatus belonging to the tricuspid valves. They may be thus arranged:

Auriculo-ventricular opening,
Opening of the pulmonary artery,
Tricuspid valves,
Semilunar valves,
Chordæ tendineæ,
Carneæ columnæ.

The *auriculo-ventricular opening* is surrounded by a fibrous ring, covered by the lining membrane of the heart. It is the opening of communication between the right auricle and ventricle.

The *opening of the pulmonary artery* is situated close to the septum ventriculorum, on the left side of the right ventricle, and upon the anterior aspect of the heart.

The *tricuspid valves* are three triangular folds of the lining membrane, strengthened by a thin layer of fibrous tissue. They are connected by their base around the auriculo-ventricular opening; and by their sides and apices, which are thickened, give attachment to a number of slender tendinous cords, called chordæ tendineæ. The *chordæ tendineæ* are the tendons of the thick muscular columns (*columnæ carneæ*) which stand out from the walls of the ventricle, and serve as muscles to the valves. A number of these tendinous cords converge to a single muscular attachment. The tricuspid valves prevent the regurgitation of blood into the auricle during the contraction of the ventricle, and they are prevented from being themselves driven back, by the chordæ tendineæ and their muscular attachments.

This connection of the muscular columns of the heart to the valves, has caused their division into active and passive. The *active* valves are the tricuspid and mitral; the *passive*, the mere folds of lining membrane, viz. the semilunar, Eustachian, and coronary.

From the remarkable arrangement of the valves, it follows, that if the right ventricle be over distended, the thin or "yielding wall" will give way, and carry with it the columns of the anterior and right valves. The cords connected with these columns will draw down the edges of the corresponding valves, and produce an opening between the curtains, through which the superabundant blood may escape, and the ventricle be relieved from over pressure. This beautiful mechanism is therefore adapted to fulfil the function of a safety valve.

The *columnæ carneæ* (fleshy columns) is a name expressive

of the appearance of the internal walls of the ventricles, which seem formed of muscular columns, interlacing in almost every direction. They are divided into three sets, according to the manner of their connection. 1. The greater number are attached by the whole of one side, and merely form convexities into the cavity of the ventricle. 2. Others are connected by both extremities, being free in the middle. 3. A few (columnæ papillares) are attached by one extremity to the walls of the heart, and by the other give insertion to the chordæ tendinæ.

The *semilunar valves*, three in number, are situated around the commencement of the pulmonary artery, being formed by a folding of its lining membrane, strengthened by a thin layer of fibrous tissue. They are attached by their convex borders, and free by the concave which are directed upwards in the course of the vessel, so that, during the current of blood along the artery, they are pressed against the sides of the cylinder; but if any attempt at regurgitation ensue, they are immediately expanded, and effectually close the entrance of the tube. The margins of the valves are thicker than the rest of their extent, and each valve presents in the centre of this margin a small fibro-cartilaginous tubercle, called *corpus Arantii*, which locks in with the two others during the closure of the valves, and secures the triangular space that would otherwise be left by the approximation of three semilunar folds.

Between the semilunar valves and the cylinder of the artery are three pouches, called the *pulmonary sinuses*. Similar sinuses are situated beneath the valves at the commencement of the aorta, and are much larger and more capacious than those of the pulmonary artery.

The *pulmonary artery* commences by a scalloped border, corresponding with the three valves, which are attached along its edge. It is connected to the ventricle by muscular fibres, and by the lining membrane of the heart.

The *left auricle* is somewhat smaller than the right; of a cuboid form, and situated more posteriorly. The *appendix auriculæ* is constricted at its junction with the auricle, and has an aborescent appearance; it is directed forwards towards the root of the pulmonary artery, to which the auriculæ of both sides appear to converge.

The left auricle is to be laid open by a ⊤ shaped incision, the horizontal section being made along the border which is attached to the base of the ventricle.

It presents for examination five openings, and the muscular structure of the appendix; these are—

Four pulmonary veins,
Auriculo-ventricular opening,
Musculi pectinati.

The *pulmonary veins*, two from the right and two from the left lung, open into the corresponding sides of the auricle. The two left pulmonary veins terminate frequently by a common opening.

The *auriculo-ventricular opening* is the aperture of communication between the auricle and ventricle.

The *musculi pectinati* are fewer in number than in the right auricle, and are situated only in the appendix auriculæ.

Left ventricle.—The left ventricle is to be opened by making an incision a little to the left of the septum ventriculorum, and continuing it around the apex of the heart, to the auriculo-ventricular opening behind.

The left ventricle is conical, both in external figure and in the form of its internal cavity. It forms the apex of the heart, by projecting beyond the right ventricle, while the latter has the advantage in length towards the base. Its walls are about seven lines in thickness, those of the right ventricle being about two lines and a half.

It presents for examination in its interior, two openings, two valves, and the tendinous cords and muscular columns; they may be thus arranged:

Auriculo-ventricular opening,
Aortic opening.

Mitral valves,
Semilunar valves.

Chordæ tendineæ,
Columnæ carneæ.

The *auriculo-ventricular opening* is a dense fibrous ring, covered by the lining membrane of the heart, but smaller in size than that of the right side.

The *mitral valves* are attached around the auriculo-ventricular opening, as are the tricuspid in the right ventricle. They are thicker than the tricuspid, and consist of only two segments, of which the larger is placed between the auriculo-ventricular opening and the commencement of the aorta, and acts the part of a valve to that foramen, during the filling of the ventricle. The difference in size of the two valves, both being triangular, and the space between them, has given rise to the idea of a "bishop's mitre," after which they are named. These valves, like the tricuspid, are furnished with an apparatus of tendinous cords, *chordæ tendineæ*, which are attached to two very large *columnæ carneæ*.

The *columnæ carneæ* admit of the same arrangement into three kinds as on the right side. Those which are free by one

extremity, the columnæ papillares, are only two in number, and much larger than those on the opposite side.

The *semilunar valves* are placed around the commencement of the aorta, like those of the pulmonary artery; they are similar in structure, and are attached to the scalloped border by which the aorta is connected with the ventricle. The tubercle in the centre of each fold is larger than those in the pulmonary valves, and it was these that Arantius particularly described; but the term *corpora arantii* is now applied indiscriminately to both. The fossa between the semilunar valves and the cylinder of the artery are much larger than those of the pulmonary artery; they are called the "*sinus aortici.*"

STRUCTURE OF THE HEART.

The arrangement of the fibres of the heart has been made the subject of careful and accurate investigation.

For the sake of clearness of description, the fibres of the ventricles have been divided into three layers—superficial, middle, and internal—all of which are disposed in a spiral direction around the cavities of the ventricles. The mode of formation of these three layers will be best understood by adopting the plan pursued by Mr. Searle in tracing the course of the fibres from the centre of the heart towards its periphery.

The left surface of the septum ventriculorum is formed by a broad and thick layer of fibres, which proceed backwards in a spiral direction around the posterior aspect of the left ventricle, and become augmented on the outer side of that ventricle, by other fibres derived from the bases of the two columnæ papillares. The broad and thick band formed by the fibres from these two sources curves around the apex and lower third of the left ventricle, to the anterior border of the septum, where it divides into two bands—a short or apicial band, and a long or basial band.

The short or *apicial band* is increased in thickness at this point by receiving a layer of fibres (derived from the root of the aorta and carnæ columneæ) upon its internal surface, from the right surface of the septum ventriculorum; it is then continued onwards in a spiral direction from left to right, around the lower third of the anterior surface, and the middle third of the posterior surface of the right ventricle to the posterior border of the septum. From the latter point the short band is prolonged around the posterior and outer border of the left ventricle to the anterior surface of the base of that ventricle, and is inserted into the anterior border of the left auriculo-ventricular ring, and the anterior part of the root of the aorta and pulmonary artery.

The long or *basial band*, at the anterior border of the septum, passes directly backwards through the septum, forming its

middle layer, to the posterior ventricular groove, where it becomes joined by fibres derived from the root of the pulmonary artery. It then winds spirally around the middle and upper third of the left ventricle to the anterior border of the septum, where it is connected by means of its internal surface with the superior fibres dirived from the aorta, which form part of the right wall of the septum. From this point it is continued around the upper third of the anterior and posterior surface of the right ventricle to the posterior border of the septum, where it is connected with the fibres constituting the right surface of the septum ventriculorum. At the latter point the fibres of this band begin to be twisted upon themselves, like the strands of a rope, the direction of the twist being from below upwards. This arrangement of fibres is called by Mr. Searle "the rope;" it is continued spirally upwards, forming the brim of the left ventricle, to the anterior surface of the base of that ventricle, where the twisting of the fibres ceases. The long band then curves inwards towards the septum, and spreads out upon the left surface of the septum into the broad and thick layer of fibres with which this description commenced.

The most inferior of the fibres of the left surface of the septum ventriculorum, after winding spirally around the internal surface of the apex of the left ventricle, so as to close its extremity, form a small fasciculus, which is excluded from the interior of the ventricle, and expands in a radiated manner over the surface of the heart, constituting its superficial layer of fibres. The direction of these fibres is, for the most part, oblique, passing from left to right on the anterior, and from right to left on the posterior surface of the heart, becoming more longitudinal near its base, and terminating by being inserted into the fibrous rings of the auriculo-ventricular openings, and of the pulmonary artery and aorta. Over the right ventricle the superficial fibres are increased in number by the addition of accessory fibres from the right surface of the septum, which pierce the middle layer, and take the same direction with the superficial fibres from the apex of the left ventricle, and of other accessory fibres from the surface of both ventricles.

From this description it will be perceived, that the *superficial layer* of fibres is very scanty, and is pretty equally distributed over the surface of both ventricles. The *middle layer* of both ventricles is formed by the two bands, short and long. But the *internal layer* of the two ventricles is very differently constituted: that of the left is formed by the spiral expansion of the fibres of the rope, and of the two columnæ piapillares; that of the right remains to be described. The septum ventriculorum also consists of three layers—a *left layer*, the radiated expansion of the rope and carneæ columnæ; a *middle layer*, the

long band; and a *right layer*, belonging to the proper wall of the right ventricle, and continuous both in front and behind with the long band, and in front also with the short band, and with the superficial layer of the right ventricle.

The *internal layer* of the right ventricle is formed by fasciculi of fibres which arise from the right segment of the root of the aorta, from the entire circumference of the root of the pulmonary artery, and from the bases of the columnæ papillares. The fibres from the root of the aorta, associated with some from the carneæ columnæ, constitute a layer which passes obliquely forwards upon the right side of the septum. The superior fibres coming directly from the aorta join the internal surface of the long band at the anterior border of the septum, while the lower two thirds of the layer are continuous with the internal surface of the short band, some of its fibres piercing that band to augment the number of superficial fibres. The fibres derived from the root of the pulmonary artery, conjoined with those from the base of one of the columnæ papillares, curve forwards from their origin, and wind obliquely downwards and backwards around the internal surface of the wall of the ventricle to the posterior border of the septum, where they become continuous with the long band, directly that it has passed backwards through the septum.

Fibres of the auricles.—The fibres of the auricles are disposed in two layers, external and internal. The *internal layer* is formed of fasciculi which arise from the fibrous rings of the auriculo-ventricular openings, and proceed upwards, to enlace with each other, and constitute the appendices auricularum. These fasciculi are parallel in their arrangement, and in the appendices form projections, and give rise to the appearance which is denominated musculi pectinati. In their course they give off branches, which connect adjoining fasciculi, and form a columnar interlacement between them.

External layer.—The fibres of the right auricle having completed the appendix, wind from left to right around the right border of this auricle, and along its anterior aspect, beneath the appendix, to the anterior surface of the septum. From the septum they are continued to the anterior surface of the left auricle, where they separate into three bands—superior, anterior, and posterior. The *superior band* proceeds onwards to the appendix, and encircles the apex of the auricle. The *anterior band* passes to the left, beneath the appendix, and winds as a broad layer completely around the base of the auricle, and through the septum to the root of the aorta, to which it is partly attached, and from this point is continued onwards to the appendix, where its fibres terminate by interlacing with the musculi pectinati. The *posterior band* crosses the left auricle ob-

liquely to its posterior part, and winds from left to right around its base, encircling the openings of the pulmonary veins; some of its fibres are lost upon the surface of the auricle, others are continued onwards to the base of the aorta; and a third set, forming a small band, is prolonged along the anterior edge of the appendix to its apex, where it is continuous with the *superior band.* The septum auricularum has four sets of fibres entering into its formation:—1. The fibres arising from the auriculo-vetricular rings at each side; 2. Fibres arising from the root of the aorta, which pass upwards to the transverse band, and to the root of the superior cava; 3. Those fibres of the anterior band that pass through the lower part of the septum in their course around the left auricle; and, 4. A slender fasciculus, which crosses through the septum from the posterior part of the right auriculo-ventricular ring to the left auricle.

It will be remarked from this description, that the left auricle is considerably thicker and more muscular than the right.

Vessels and *nerves.*—The *arteries* supplying the heart are the anterior and posterior coronary.

The *veins* accompany the arteries, and empty themselves by the common coronary vein into the right auricle. The *lymphatics* terminate in the glands about the root of the heart. The *nerves* of the heart are derived from the cardiac plexuses, which are formed by communicating filaments from the sympathetic and pneumogastric.

ORGANS OF RESPIRATION AND VOICE.

The organs of respiration are the two lungs, with their air-tube, the trachea, to the upper part of which is adapted an apparatus of cartilages, constituting the organ of voice, or larynx.

LARYNX.

The *larynx* is situated at the fore part of the neck, between the trachea and the base of the tongue. It is composed of *cartilages*, *ligaments*, *muscles*, *vessels*, and *nerves*, and *mucus membrane.*

The *cartilages* are—the

Thyroid,
Cricoid,
Two Arytenoid,
Epiglottis.

The *thyroid* is the largest cartilage of the larynx; it consists of two lateral portions, or *alæ*, which meet at an acute angle in front, and form the projection which is known by the name of *pomum Adami.* Where the pomum Adami is prominent, a bursa mucosa is often found between it and the skin.

Each ala is quadrilateral, and forms a rounded border posteri-

orly, which terminates above in the *superior cornu*, and below in the *inferior cornu*. Upon the side of the ala is an *oblique line*, into which the sterno-thyroid muscle is inserted, and from which the thyro-hyoide takes its origin. Behind this is a *vertical line*, which gives origin to the inferior constrictor muscle. In the *receding angle* formed by the meeting of the two alæ upon the inner side of the cartilage, and near to its lower border, are attached the epiglottis, the chordæ vocales, the thyro-arytenoid, and thyro-epiglottidean muscles.

The *cricoid* is a ring of cartilage, narrow in front and broad behind, where it is surmounted by *two rounded surfaces*, which articulate with the arytenoid cartilages. Upon the middle line, posteriorly, is a *vertical ridge* which gives attachment to the œsophagus, and on each side of the ridge are the depressions which lodge the crico-arytenoidei postici muscles. On either side of the ring is a *glenoid cavity*, which articulates with the inferior cornu of the thyroid cartilage.

The *arytenoid cartilages*, two in number, are triangular in form. They are broad below, where they articulate with the upper border of the cricoid, and give attachment to the crico-arytenoidei postici, crico-arytenoidei laterales, and thyro-arytenoidei muscles, and chordæ vocales; and pointed above, where they articulate with two little curved cartilages, called *cornicula laryngis* (capitula laryngis). On the posterior surface they are concave, and lodge the arytenoideus muscle.

The *epiglottis* is a fibro-cartilage of a yellowish color, studded with a small number of mucus glands, which are lodged in shallow pits upon its surface. It is shaped like a cordate leaf, and is placed immediately in front of the opening of the larynx, which it closes completely when the larynx is drawn up beneath the base of the tongue. It is attached by its point to the *receding angle*, between the two alæ of the thyroid cartilage.

Two small cartilaginous tubercles (cuneiform) are often found in the folds of the mucous membrane which bound the opening of the larynx laterally.

Ligaments.—The *ligaments* of the larynx are numerous, and may be arranged into four groups: 1. Those that articulate the thyroid with the os hyoides. 2. Those which connect it with the cricoid. 3. Ligaments of the arytenoid cartilages. 4. Ligaments of the epiglottis.

1. The ligaments which connect the thyroid cartilage with the os hyoides are three in number:

The two *thyro-hyoidean ligaments* pass between the supe-

rior cornua of the thyroid and the extremities of the greater cornua of the os hyoides; a sesamoid bone is found in each.

The *thyro-hyoidean membrane* is a broad membranous layer, occupying the entire space between the thyroid cartilage and os hyoides. It is pierced by the superior laryngeal nerve and artery.

2. The ligaments connecting the thyroid to the cricoid cartilage are also three in number:

Two *capsular ligaments*, with their synovial membranes, which form the articulation between the inferior cornua of the thyroid and the sides of the cricoid, and the *crico-thyroidean membrane*, through which the operation of laryngotomy is performed. The latter is generally crossed by a small artery, the inferior laryngeal.

3. The ligaments of the arytenoid cartilages are four in number:

Two *capsular ligaments* and synovial membranes, which articulate the arytenoid cartilages with the cricoid; and the *thyro-arytenoid ligaments*, or *chordæ vocales*, which pass backwards from the receding angle of the thyroid cartilage, near to its lower border, to be inserted into the bases of the arytenoid cartilages. The space between these two ligaments is the glottis, or rima glottidis.

4. The ligaments of the epiglottis are five in number:

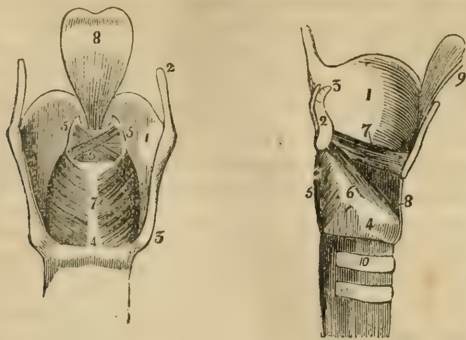
1. Three folds of mucous membrane, one at the middle, and one on each side, called *fræna epiglottidis*, which hold the epiglottis back to the tongue. 2. *Epiglotto-hyoidean ligament*, which connects the epiglottis to the posterior surface of the os hyoides. 3. The ligament which attaches the epiglottis to the receding angle of the thyroid cartilage.

The *muscles* of the larynx are eight in number: the five larger are the muscles of the chordæ vocales and rima glottidis; the three smaller are muscles of the epiglottis.

The five muscles of the chordæ vocales and rima glottidis are—the

Crico-thyroid,
Crico-arytenoideus posticus,
Crico-arytenoideus lateralis,
Thyro arytenoideus,
Arytenoideus.

NO. 14.—POSTERIOR* AND SIDE† VIEWS OF THE LARYNX.



The *crico-thyroid* muscle arises from the anterior surface of the cricoid cartilage, and is inserted into the lower and inner border of the thyroid.

The *crico-arytenoideus posticus* arises from the depression on the posterior surface of the croicoid cartilage, and is inserted into the outer angle of the base of the arytenoid.

The *crico-arytenoideus lateralis* arises from the upper border of the side of the cricoid, and is inserted into the outer angle of the base of the arytenoid cartilage.

The *thyro-arytenoideus* arises from the receding angle of the thyroid cartilage, close to the outer side of the chorda vocalis, and passes backwards parallel with the chord, to be inserted into the base of the arytenoid cartilage.

The *arytenoideus* muscle occupies the posterior concave surface of the arytenoid cartilages, between which it is stretched. It consists of three planes of transverse and oblique fibres; hence it was formerly considered as several muscles, under the names of *transversi* and *obliqui*..

The three muscles of the epiglottis are—the

Thyro-epiglottideus,
Aryteno-epiglottideus superior,
Aryteno-epiglottideus inferior (Hilton's muscle).

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* 1. The thyroid cartilage. 2. One of its ascending cornua. 3. One of the descending cornua. 4. The cricoid cartilage. 5, 5. The arytenoid cartilages. 6. The arytenoideus muscle, consisting of oblique and transverse fasciculi. 7. The crico-arytenoidei postici muscles. 8. The epiglottis.

† [One ala of the thyroid cartilage has been removed.] 1. The remaining ala of the thyroid cartilage. 2. One of the arytenoid cartilages. 3. One of the cornicula laryngis. 4. The cricoid cartilage. 5. The crico-arytenoideus posticus muscle. 6. The crico-arytenoideus lateralis. 7. The thyro-arytenoideus. 8. The crico-thyroidean membrane. 9. One half of the epiglottis. 10. The upper part of the trachea.

The *thyro-epiglottideus* appears to be formed by the upper fibres of the thyro-arytenoideus muscle; they spread out upon the external surface of the sacculus laryngis, on which they are lost; a few of the anterior fibres being continued onwards to the side of the epiglottis.

The *aryteno-epiglottideus superior* consists of a few scattered fibres, which pass forwards in the fold of mucus membrane forming the latteral boundary of the entrance into the larynx from the apex of the arytenoid cartilage to the side of the epiglottis.

The *aryteno-epiglottideus inferior.*—This muscle was discovered by Mr. Hilton, and is very important in relation to the sacculus laryngis, with which it is closely connected. It may be found by raising the mucous membrane immediately above the ventricle of the larynx. It arises by a narrow and fibrous origin from the arytenoid cartilage, just above the attachment of the chorda vocalis; and passing forwards, and a little upwards, expands over the upper half, or two thirds of the sacculus larygnis, and is inserted by a broad attachment into the side of the epiglottis.

Actions.—The crico-thyroid and arytenoid muscles are *contractors* of the rima glottidis; the crico-arytenoideus posticus and lateralis, and the thyro-arytenoideus, are *dilators*.

The crico-thyroid muscles elongate, and thereby bring together the chordæ vocales, by drawing the thyroid cartilage downwards and forwards; their posterior attachment at the arytenoid cartilages being fixed. The arytenoid muscle approximates the arytenoid cartilages, and consequently the chordæ vocales, directly. The crico-thyroidei postici being attached to the outer angles of the bases of the arytenoid cartileges, draw them from each other, and stretch the chordæ vocales. The crico-arytenoidei laterales draw the arytenoid cartilages from each other, but relax the chordæ vocales; and the thyro-arytenoidei increase the width of the glottis, by directly relaxing the chordæ vocales.

The thyro-epiglottideus acts principally by compressing the glands of the sacculus laryngis and the sac itself: by its attachment to the epiglottis it would act feebly upon that valve. The aryteno-epiglottideus superior serves to keep the mucous membrane of the sides of the opening of the glottis tense, when the larynx is drawn upwards, and the opening closed by the epiglottis. Of the aryteno-epiglottideus, the functions appear to be, to compress the subjacent glands which open into the pouch; to diminish the capacity of that cavity, and change its form; and to approximate the epiglottis and the arytenoid cartilage.

Mucous membrane.—The larynx is lined by the mucous

membrane, which is continued from the mouth and pharynx, and prolonged onwards through the trachea and bronchi to the bronchial cells. The chordæ vocales form two horizontal projections of the mucous membrane, and constitute the lateral boundaries of the *glottis*, or *rima glottidis*. Immediately above the horizontal projection of the chorda vocalis, at each side, is a depressed fossa, the *ventricle of the larynx*. The superior boundary of the ventricle is an arched border of mucous membrane, which is very incorrectly termed the *superior chorda vocalis*. If the rounded extremity of a probe be introduced into the ventricle of the larynx, and then directed upwards, it will enter a considerable pouch, which has been recently described by Mr. Hilton as the *sacculus laryngis*. From the ventricle of the larynx the sacculus is continued upwards, nearly as high as the upper border of the thyroid cartilage, and sometimes beyond it. When dissected from the interior of the larynx, it is found covered by the aryteno-epiglottideus muscle, and a fibrous membrane, which is attached to the superior chorda vocalis below; to the epiglottis in front; and to the upper border of the thyroid cartilage above. If examined from the exterior of the larynx, it will be seen to be covered by the thyro-epiglottideus muscle. On the surface of its mucous membrane are the openings of sixty or seventy small follicular glands, which are situated in the sub-mucous tissue, and give its external surface a rough and ill-dissected appearance. This mucous secretion is intended for the lubrication of the chordæ vocales, and is directed upon them by two small valvular folds of the mucous membrane, which are situated at the entrance of the sacculus.

The *entrance of the larynx* is formed by two folds of mucous membrane, stretched between the apices of the arytenoid cartilages and the sides of the epiglottis. The arytenoid glands and superior aryteno-epiglottidean muscles are situated within these folds.

The *glands* of the larynx are—1. The *epiglottic*—most improperly named—for it consists merely of a mass of fat, situated between the convexity of the epiglottis and the thyro-hyoid membrane. 2. The *arytenoid* glands, some small granules found in the folds of mucous membrane near the apex of the arytenoid cartilage.

Vessels and *nerves*.—The *arteries* of the larynx are derived from the superior and inferior thyroid. The *nerves* are the superior laryngeal and recurrent laryngeal; both branches of the pneumogastric. The two nerves communicate with each other freely; but the superior laryngeal is distributed principally to the mucous membrane at the entrance of the larynx; the recurrent, to the muscles.

In children, and in the female, the larynx is less developed

than in the adult male; the thyroid cartilage forms a more obtuse angle and is less firm: in the male the angle is acute, and the cartilages often converted into bone.

THE TRACHEA.

The *trachea* extends from opposite the fifth cervical vertebra to opposite the third dorsal, where it divides into the two bronchi. The *right bronchus*, larger than the left, passes off at nearly right angles, to the upper part of the corresponding lung. The *left* descends obliquely, and passes beneath the arch of the aorta, to the left lung.

The *trachea* is composed of—

Fibro-cartilaginous rings,
Fibrous membrane,
Mucous membrane,
Longitudinal elastic fibres,
Muscular fibres,
Glands.

The *fibro-cartilaginous rings* are from fifteen to twenty in number, and extend for two thirds around the cylinder of the trachea. They are deficient at the posterior part, where the tube is completed by fibrous membrane. The last ring has usually a triangular form in front. The rings are connected to each other by a membrane of *yellow elastic fibrous tissue*, which in the space between the extremities of the cartilages, posteriorly, forms a distinct layer.

The *longitudinal elastic fibres* are situated immediately beneath the mucous membrane, on the posterior part of the trachea, and enclose the entire cylinder of the bronchial tubes, to their ultimate terminations.

The *muscular* fibres form a thin layer, extending transversely between the extremities of the cartilages. On the posterior surface they are covered by a cellulo-fibrous lamella, in which are lodged the *tracheal glands*. These are small flattened ovoid bodies, situated in a great number between the fibrous and muscular layers of the membranous portion of the trachea, and also between the two layers of elastic fibrous tissue connecting the rings. They pour their secretion upon the mucous membrane.

Thyroid gland.—The thyroid gland is one of those organs which it is found extremely difficult to classify, from the absence of any positive knowledge with regard to its function. It is situated upon the trachea, and in an anatomical arrangement should therefore be considered in this place, although bearing no part in the function of respiration.

This gland consists of two lobes, which are placed one on

each side of the trachea, and are connected with each other by means of an *isthmus*, which crosses its upper rings. There is considerable variety in the situation and breadth of this isthmus; which should be recollected in the performance of operations upon the trachea. In structure it appears to be composed of a dense cellular parenchyma, enclosing a great number of vessels. The gland is larger in young subjects, and in females, than in the adult and males. It is the seat of an enlargement called bronchocele, goitre, or the Derbyshire neck.

A muscle is occasionally found connected with its upper border or with its isthmus; and attached, superiorly, to the body of the os hyoides, or the thyroid cartilage. It was named by Soemmering the *levator glandulæ thyroidæ*.

Vessels and *nerves*.—It is abundantly supplied with blood by the superior and inferior thyroid arteries. Sometimes an additional artery is derived from the arteria innominata, and ascends upon the front of the trachea, to be distributed to the gland. The wound of this vessel in tracheotomy might be fatal to the patient. The *nerves* are derived from the superior laryngeal and sympathetic.

THE LUNGS.

The lungs are two conical organs, situated one on each side of the chest, embracing the heart, and separated from each other by a membranous partition, the mediastinum. On the external or thoracic side they are convex and correspond with the form of the cavity of the chest; internally they are concave, to receive the convexity of the heart. Superiorly, they terminate in a tapering cone, which extends above the level of the first rib; and inferiorly they are broad and concave, and rest upon the convex surface of the diaphragm. Their posterior border is rounded and broad, the anterior sharp and marked by one or two deep fissures, and the inferior which surrounds the base is also sharp.

The color of the lungs is pinkish grey, mottled, and variously marked with black. The surface is figured with irregularly quadrilateral and pentagonal outlines, which represent the lobules of the organ, and the area of each of these quadrilateral and pentagonal spaces is crossed by lighter lines.

Each lung is divided into two lobes, by a long and deep fissure, which extends from the posterior surface of the upper part of the organ, downwards and forwards to near the anterior angle of its base.

In the right lung the upper lobe is subdivided by a second fissure, which extends obliquely forwards from the middle of the preceding to the anterior border of the organ, and marks off a small triangular lobe.

The right lung is larger than the left, in consequence of the inclination of the heart to the left side. It is also shorter, from the great convexity of the liver, which presses the diaphragm upwards upon the right side of the chest considerably above the level of the left. It has three lobes.

The left lung is smaller, has but two lobes, but is longer than the right.

Each lung is retained in its place by its *root*, which is formed by the pulmonary artery, pulmonary veins, and bronchial tubes, together with the bronchial vessels and pulmonary plexuses of nerves. The large vessels of the root of each lung are arranged in a similar order, from before backwards, on both sides, viz :—

Pulmonary veins,
Pulmonary artery,
Bronchus.

From above, downwards, on the right side, this order is exactly reversed ; but on the left side the bronchus has to stoop beneath the arch of the aorta, which alters its position to the vessels. They are thus disposed on the two sides :—

Right.	*Left.*
Bronchus,	Artery,
Artery,	Bronchus,
Veins.	Veins.

Structure.—The lungs are composed of the ramifications of the bronchial tubes which terminate in bronchial cells (air cells) of the ramifications of the pulmonary artery and veins, bronchial arteries and veins, lymphatics and nerves. The whole of these structures being held together by cellular tissue, which constitutes their *parenchyma.*

Bronchial tubes.—The two bronchi proceed from the bifurcation of the trachea to their corresponding lungs. The right takes its course nearly at right angles with the trachea, and enters the upper part of the right lung, while the left, longer and smaller than the right, passes obliquely beneath the arch of the aorta, and enters the lung at about the middle of its root. Upon entering the lungs they divide into two branches, and each of these divides and subdivides dichotomously to their ultimate termination in small dilated sacs, the bronchial or pulmonary cells.

The fibro-cartilaginous rings which are observed in the trachea become incomplete and irregular in shape in the bronchi, and in the smaller bronchial tubes are lost altogether. At the termination of these tubes the fibrous and muscular coats bebome extremely thin, and are probably continued upon the lining mucous membrane of the air cells.

The *pulmonary artery*, conveying the dark and impure venous blood to the lungs, terminates in capillary vessels, which form a miuute net-work upon the parietes of the bronchial cells, and then converge, to form the pulmonary veins by which the arterial blood, purified in its passage through the capillaries, is returned to the left auricle of the heart.

The *bronchial arteries*, branches of the thoracic aorta, ramify upon the bronchial tubes and in the tissue of the lungs, and supply them with nutrition, while the venous blood is returned by the bronchial veins to the vena azygos.

The *lymphatics*, commencing upon the surface and in the substance of the lungs, terminate in the bronchial glands. These glands, very numerous and often of large size, are placed at the roots of the lungs, around the bronchi, and at the bifurcation of the trachea. In early life, they resemble lymphatic glands in other situations; but in old age, and often in the adult, they are quite black, and filled with carbonaceous matter, and occasionally with calcareous deposits.

The *nerves* are derived from the pneumogastric and sympathetic. They form two plexuses—*anterior pulmonary plexus* situated upon the front of the root of the lungs, and composed chiefly of filaments from the great cardiac plexus; and *posterior pulmonary plexus*, on the posterior aspect of the root of the lungs, composed principally of branches from the pneumogastric. The branches from these plexuses follow the course of the bronchial tubes, and are distributed to the bronchial cells.

PLEURÆ.

Each lung is enclosed, and its structure maintained, by a serous membrane, the pleura, which invests it as far as the root, and is thence reflected upon the parietes of the chest. That portion of the membrane which is in relation with the lung is called *pleura pulmonalis*, and that in contact with the parietes, *pleura costalis*. The reflected portion, besides forming the internal lining to the ribs and intercostal muscles, also covers the diaphragm and the thoracic surface of the vessels at the root of the neck.

The pleura must be dissected from off the root of the lung, to see the vessels by which it is formed, and the pulmonary plexuses.

MEDIASTINUM.

The approximation of the two reflected pleuræ in the middle line of the thorax forms a septum which divides the chest into the two pulmonary cavities. This is the mediastinum. The two pleuræ are not, however, in contact with each other at the middle line in the formation of the mediastinum, but leave a

space between them which contains all the viscera of the chest, with the exception of the lungs. The mediastinum is divided into the anterior, middle, and posterior.

The *anterior mediastinum* is a triangular space, bounded in front by the sternum, and on each side by the pleura. It contains a quantity of loose cellular tissue, in which are found some lymphatic glands and vessels passing up from the liver; the remains of the thymus gland, the origins of the sterno-hyoid and sterno-thyroid muscles, and the internal mammary vessels of the left side.

The *middle mediastinum* contains the heart enclosed in its pericardium, the ascending aorta, the superior vena cava, the bifurcation of the trachea, the pulmonory arteries and veins, and the phrenic nerves.

The *posterior mediastinum* is bounded behind by the vertebral column, in front by the pericardium, and on each side by the pleura. It contains the descending aorta, the greater and lesser azygos veins and superior intercostal vein, the thoracic duct, the œsophagus and pneumogastric nerves, and the great splanchnic nerves.

ABDOMEN.

The abdomen is the inferior cavity of the trunk of the body; it is bounded in front and at the sides by the lower ribs and abdominal muscles; behind, by the vertebral column and abdominal muscles; above, by the diaphragm, and below by the pelvis; and contains the alimentary canal, the organs subservient to digestion, viz. the liver, pancreas, and spleen, and the organs of excretion, the kidneys, with the supra-renal capsules.

Regions.—For convenience of description of the viscera, and reference to the morbid affections of this cavity, the abdomen is divided into certain districts or regions. Thus, if two transverse lines be carried around the body, the one parallel with the convexities of the ribs, the other with the highest points of the crests of the ilia, the abdomen will be divided into three zones. Again, if a perpendicular line be drawn at each side, from the cartilage of the eighth rib to the middle of Poupart's ligament, the three primary zones will each be subdivided into three compartments or regions, a middle and two lateral.

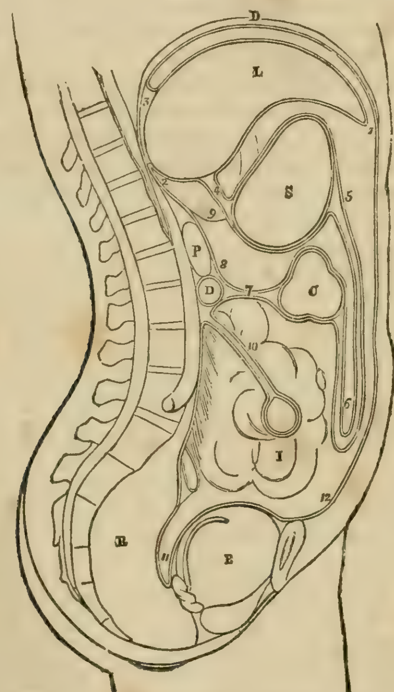
The middle region of the upper zone being immediately over the small end of the stomach, is called *epigastric.* The two lateral regions being under the cartilages of the ribs, are called *hypochondriac.* The middle region of the middle zone is the *umbilical;* the two lateral, the *lumbar.* The middle region of the infeior zone is the *hypogastric*, and the two lateral the *iliac.* In addition to these divisions, we constantly use the term *inguinal region*, in reference to the vicinity of Poupart's ligament.

Position of the viscera.—In the upper zone will be seen the

liver, extending across from the right to the left side; the stomach and spleen on the left, and the pancreas and duodenum behind. In the middle zone is the transverse portion of the colon, with the upper part of the ascending and descending colon, omentum, small intestines, mesentery, and behind, the kidneys and supra-renal capsules. In the inferior zone is the lower part of the omentum and small intestines, the cæcum, ascending and descending colon, with the sigmoid flexure and ureters.

The smooth and polished surface which the viscera and pariates of the abdomen present, is due to the *peritoneum*, which should in the next place be studied.

PLATE 15.*



* *The Reflections of the Peritoneum.* D. The diaphragm. S. The stomach. C. The transverse colon. D. The transverse duodenum. P. The Pancreas. I. The small intestines. R. The Rectum. B. The urinary bladder. 1. The anterior layer of the peritoneum, lining the under surface of the diaphragm. 2. The posterior layer. 3. The two layers passing to the posterior border of the liver, and forming the coronary ligament. 4. The lesser omentum; the two layers passing from the under surface of the liver to the lesser curve of the stomach. 5. The two layers meeting at the greater curve, then passing downwards and returning upon themselves, forming (6) the greater omentum. 7. The transverse meso-colon. 8. The posterior layer traced upwards

PERITONEUM.

The *peritoneum* is a serous membrane, and therefore a shut sac; a single exception exists in the human subject to this character, viz. in the female, where the peritoneum is perforated by the open extremities of the Fallopian tubes, and is continuous with their mucous lining.

The simplest idea that can be given of a serous membrane, which may apply equally to all, is, that it invests the viscus or viscera, and is then reflected upon the parietes of the containing cavity. If the cavity contain only a single viscus, the consideration of the serous membrane is extremely simple. But in the abdomen, where there are a number of viscera. the serous membrane passes from one to the other until it has invested the whole, before it is reflected on the parietes. Hence its reflections are a little more complicated.

In tracing the reflections of the peritoneum in the middle line, we commence with the diaphragm, which is lined by two layers, one from the parietes in front, anterior, and one from the parieties behind, posterior. These two layers of the same membrane, at the posterior part of the diaphragm, descend to the upper surface of the liver, forming the *coronary* and *lateral ligaments* of the liver. They then surround the liver, one going in front, the other behind that viscus, and, meeting at its under surface, pass to the stomach, forming the *lesser omentum.* They then, in the same manner, surround the stomach, and, meeting at its lower border, descend for some distance in front of the intestines, and return to the transverse colon, forming the *great omentum;* they then surround the transverse colon, and pass directly backwards to the vertebral column, forming the transverse *meso-colon.* Here the two layers separate; the posterior ascends in front of the pancras and aorta, and returns to the posterior part of the diaphragm, where it forms the posterior layer with which we commenced. The anterior descends, invests all the small intestines, and returning to the vertebral column forms the *mesentery.* It then descends into the pelvis in front of the rectum, which it holds in its place by means of a fold called *meso-rectum*, forms a pouch, the *recto-vesical fold*, between it and the bladder, ascends upon the posterior surface of the bladder, forming its false ligaments, and

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in front of D, the transverse duodenum, and P, the pancreas, to become continuous with the posterior layer (2). 9. The foramen of Winslow; the dotted line bounding this foramen inferiorly, marks the course of the hepatic artery forwards, to enter between the layers of the lesser omentum. 10. The mesentery encircling the small intestine. 11. The recto-vesical fold, formed by the descending anterior layer. 12. The anterior layer traced upwards upon the internal surface of the abdominal parietes to the layer (1), with which the examination commenced.

returns upon the anterior parietes of the abdomen, to the diaphragm, whence we first traced it.

In the female, after descending into the pelvis in front of the rectum, it is reflected upon the posterior surface of the vagina and uterus. It then descends on the anterior surface of the uterus, and forms at either side the broad ligaments of that organ. From the uterus it ascends upon the posterior surface of the bladder and anterior parietes of the abdomen, and is continued, as in the male, to the diaphragm.

In this way the continuity of the peritoneum, as a whole, is distinctly shown, and it matters not where the examination commence or where it terminate; still the same continuity of surface will be discernable throughout. If we trace it from side to side of the abdomen, we may commence at the umbilicus; we then follow it outwards lining the inner side of the parietes to the ascending colon; it surrounds that intestine; it then surrounds the small intestine, and returning on itself forms the mesentery. It then invests the descending colon, and reaches the parietes on the opposite side of the abdomen, from whence it may be traced to the exact point from which we started.

The viscera, which are thus shown to be invested by the peritoneum in its course downwards, are—the

Liver,
Stomach,
Transverse colon,
Small intestines,
Pelvic viscera.

The folds formed between these and between the diaphragm and the liver, are—

(Diaphragm.)

Broad, coronary, and lateral ligaments.

(Liver.)

Lesser omentum.

(Stomach.)

Greater omentum.

(Transverse colon.)

Transverse meso-colon,
Mesentery,
Meso-rectum,
Recto-vesical fold,

False ligaments of the bladder.

And in the female, the

Broad ligaments of the uterus.

The ligaments of the liver will be examined with that organ.

The *lesser omentum* is the duplicature passing between the liver and the upper border of the stomach. It is extremely thin, excepting at its right border, where it is free, and contains between its layers, the

Hepatic artery,
Ductus communis choledochus,
Portal vein,
Hepatic plexus of nerves,
Lymphatics.

The structures are enclosed in a loose cellular tissue, called Glisson's capsule. The relative position of the three vessels is, the artery to the left, the duct to the right, and the vein between and behind.

If the finger be introduced behind this right border of the lesser omentum, it will be situated in an opening called the *foramen of Winslow.* In front of the finger will lie the right border of the lesser omentum; behind it the diaphragm, covered by the ascending or posterior layer of the peritoneum; below, the hepatic artery, curving forwards from the cœliac axis; and above, the lobus Spigelii. These, therefore, are the boundaries of the foramen of Winslow, which is nothing more than a constriction of the general cavity of the peritoneum at this point, arising out of the necessity for the hepatic and gastric arteries to pass forwards from the cœliac axis to reach their respective viscera.

If the air be blown through the foramen of Winslow, it will descend behind the lesser omentum and stomach to the space between the desending and ascending pair of layers, forming the great omentum. This is sometimes called the lesser cavity of the peritoneum, and that external to the foramen the greater cavity; in which case the foramen is considered as the means of communication between the two. There is a great objection to this division, as it might lead the inexperienced to believe that there were really two cavities. There is but one only, the foramen of Winslow being merely a constriction of that one, to facilitate the communication between the nutrient arteries and the viscera of the upper part of the abdomen.

The *great omentum* consists of *four layers of peritoneum*, the two which descend from the stomach, and the same two, returning upon themselves to the transverse colon. A quantity of adipose substance is deposited around the vessels which ramify through its structure. It would appear to perform a double function in the economy. 1st. Protecting the intestines from cold; and, 2dly. Facilitating the movement of the intestines upon each other during their vermicular action.

The *transverse meso-colon* is the medium of connection between the transverse colon and the posterior wall of the abdomen. It also affords to the nutrient arteries a passage to reach the intestine; and encloses between its layers, at the posterior part, the transverse portion of the duodenum.

The *mesentery* is the medium of connection between the small intestines and the posterior wall of the abdomen. It is oblique in its direction, being attached to the posterior wall, from the left side of the second lumbar vertebra to the right iliac fossa. It retains the small intestines in their places, and gives passage to the mesenteric arteries, veins, nerves, and lymphatics.

The *meso-rectum*, in like manner, retains the rectum in connection with the front of the sacrum. Besides this, there are some minor folds in the pelvis, as the *recto-vesical* fold, the *false ligaments of the bladder*, and *broad ligaments of the uterus.*

The *appendices epiploicæ* are small irregular pouches of peritoneum, filled with fat, and situated like fringes upon the large intestine.

Three other duplicatures of peritoneum are situated in the sides of the abdomen; they are the gastro-splenetic omentum, the ascending and descending meso-colon. The *gastro-splenic omentum* is the duplicature which connects the spleen to the stomach; and the *ascending* and *descending meso-cola* are the folds which retain the corresponding portions of the colon in their situations.

Structure of serous membrane.—Serous membrane consists of two layers, an external or cellular layer, and an internal layer, or epithelium. The *cellular layer* upon its outer surface is rough and vascular, and adherent to surrounding structures; but on its inner surface is dense and smooth, and wholly deficient of vessels carrying red blood. The smooth and brilliant surface of serous membrane is due to a distinct epithelium, which has been shown to be composed of laminæ of viscicles, and of flattened polygonal scales with central nuclei, like the epithelium of mucous membrane. This structure may be easily demonstrated with a good microscope upon the surface of all the serous membranes of the body, upon the surface of the lining membrane of arteries and veins, and upon synovial membranes.

The general characters of a serous membrane are its resemblance to a shut sac, and its secretion of a peculiar fluid resembling the serum of the blood; but neither of these characters is absolutely essential to the identity of a serous membrane; for in the internal ear we have an instance of a mucous membrane being a shut sac, a condition not uncommon among animals.

Again, as we have shown, the peritoneum in the female is perforated by the extremities of the Fallopean tubes; while in reptiles there is a direct communication between its cavity and the medium in which they live.

From the variable nature of the secretion of these membranes, they have been divided into two classes—the true serous membranes, viz. the arachnoid, pericardium, pleuræ, peritoneum and tunicæ vaginales, which pour out a secretion containing but a small proportion of albumen; and the synovial membranes and bursæ, which secrete a fluid containing a larger quantity of albumen.

ALIMENTARY CANAL

The *alimentary canal* is a musculo-membranous tube, extending from the mouth to the anus. It is variously named in the different parts of its course; hence it is divided into the

Mouth,	
Pharynx,	
Œsophagus,	
Stomach,	
Small intestine	Duodenum, Jejunum, Ileum,
Large intestine	Cæcum, Colon, Rectum.

The *mouth* is the irregular cavity which contains the organs of taste and the principal instruments of mastication. It is bounded in front by the lips, on either side by the internal surface of the cheeks; above, by the hard palate and teeth of the upper jaw; below, by the tongue, by the mucous membrane stretched between the arch of the lower jaw and the under surface of the tongue, and by the teeth of the inferior maxilla; and behind by the soft palate and fauces.

The *lips* are two fleshy folds, formed externally by common integument, and internally by mucous membrane, and containing between these two layers the muscles of the lips, a quantity of fat, and numerous small labial glands. They are attached to the surface of the upper and lower jaw, and each lip is connected to the gum in the middle line by a fold of mucous membrane, the frænum labii superioris, and frænum labii inferioris, the former being the larger.

The *cheeks* (buccæ) are continuous on either hand with the lips, and form the sides of the face; they are composed of integument, a large quantity of fat, muscles, mucous membrane, and buccal glands.

The mucous membrane lining the cheeks is reflected above and below upon the sides of the jaws, and is attached posteriorly to the anterior margin of the ramus of the lower jaw. At about its middle, opposite to the second molar tooth of the upper jaw, is a papilla, upon which may be observed a small opening, the entrance of the duct of the parotid gland.

The *hard palate* is a dense structure, composed of mucous membrane, palatal glands, fibrous tissue, vessels, and nerves, and firmly connected to the palate processes of the superior maxillary and palate bones. It is bounded in front, and on each side, by the alveolar processes and gums, and is continuous behind with the soft palate. It is marked along the middle line by an elevated raphe, and presents upon each side of the raphe a number of transverse ridges and grooves. Near the anterior extremity, and immediately behind the middle incisor teeth, is a papilla which corresponds with the termination of the naso-palatine canal, and has been supposed to be endowed with a peculiar sensibility.

The *gums* are composed of a thick and dense mucous membrane, which is closely adherent to the periosteum of the alveolar processes, and embraces the necks of the teeth. They are remarkable for their hardness and insensibility, and for their close contact, without adhesion, to the surface of the tooth. From the neck of the tooth they are reflected into the aveolus, and become continuous with the periosteal membrane of that cavity.

The *tongue* has been described as an organ of sense; it is invested by mucous membrane, which is reflected from its under part upon the inner surface of the lower jaw, and constitutes, with the muscles beneath, the floor of the mouth. Upon the under surface of the tongue, near to its anterior part, the mucous membrane forms a considerable fold, which is called the frænum linguæ; and on each side of the frænum is a large papilla, the commencement of the duct of the submaxillary gland, and several smaller openings, the ducts of the sublingual gland.

The *soft palate* (velum pendulum palati) is a fold of mucous membrane, situated at the posterior part of the mouth. It is continuous superiorly with the hard palate, and is composed of mucous membrane, palatal glands, and muscles. Hanging from the middle of its inferior border is a small rounded process, the *uvula:* and passing outwards from the uvula on each side are two curved folds of the mucous membrane, the arches or pillars of the palate. The anterior pillar is continued downwards to the side of the base of the tongue, and is formed by the projection of the palato-glossus muscle. The posterior pillar is prolonged downwards and backwards into the pharynx, and is

formed by the convexity of the palato-pharyngeus muscle. These two pillars, closely united above, are separated below by a triangular interval or niche, in which the tonsil is lodged.

The *tonsils* (amygdalæ) are two glandular organs, shaped like almonds, and situated between the anterior and posterior pillar of the soft palate, on each side of the fauces. They are cellular in texture, and composed of an assemblage of mucous follicles, which open upon the surface of the gland. Externally, they are invested by the pharyngeal fascia, which separates them from the superior constrictor muscle and internal carotid artery, and prevents an abscess opening in that direction. In relation to surrounding parts, they correspond with the angle of the lower jaw.

The space included between the soft palate and the root of the tongue is the *isthmus of the fauces.* It is bounded *above* by the soft palate; on each *side*, by the pillars of the soft palate and tonsils; and *below*, by the root of the tongue. It is the opening between the mouth and pharynx.

SALIVARY GLANDS.

Communicating with the mouth are the excretory ducts of three pairs of salivary glands, the parotid, submaxillary, and sublingual.

The *parotid gland*, the largest of the three, is situated immediately in front of the external ear, and extends superficially for a short distance over the masseter muscle, and deeply behind the ramus of the lower jaw. It reaches inferiorly to below the level of the angle of the lower jaw, and posteriorly to the mastoid process, slightly overlapping the insertion of the sterno-mastoid muscle. Embedded in its substance is the external carotid artery, temporo-maxillary vein, and facial nerve; and, emerging from its anterior border, the transverse facial artery, and branches of the pes anserinus; and, above, the temporal artery.

The duct of the parotid gland commences at the papilla upon the internal surface of the cheek, opposite the second molar tooth of the upper jaw; and, piercing the buccinator muscle, crosses the masseter to the anterior border of the gland, where it divides into several branches, which subdivide and ramify through its structure, to terminate in the small cæcal pouches of which the gland is composed. A small branch is generally given off from the duct while crossing the masseter muscle, which forms, by its ramifications and terminal dilatations, a small glandular appendage, the socia parotidis. Stenon's duct is remarkably dense and of considerable thickness, while the area of its canal is extremely small.

The *submaxillary gland* is situated in the posterior angle

of the submaxillary triangle of the neck. It rests upon the hyo-glossus and mylo-hyoideus muscles, and is covered in by the body of the lower jaw and by the deep cervical fascia. It is separated from the parotid gland by the stylo-maxillary ligament, and from the sublingual by the mylo-hyoideus muscle. Embedded among its lobules is the facial artery and the submaxillary ganglion.

The *excretory duct* (Wharton's) of the submaxillary gland commences upon the papilla, by the side of the frænum linguæ, and passes backwards beneath the mylo-hyoideus and resting upon the hyo-glossus muscle, to the middle of the gland, where it divides into numerous branches, which ramify through the structure of the gland to its cæcal terminations. It lies in its course against the mucous membrane forming the floor of the mouth, and causes a projecting ridge upon its surface.

The *sublingual* is an elongated and flattened gland, situated beneath the mucous membrane of the floor of the mouth, on each side of the frænum linguæ. It is in relation, *above*, with the mucous membrane; *in front*, with the depression by the side of the symphysis of the lower jaw; *externally*, with the mylo-hyoideus muscle; and *internally*, with the lingual nerve and genio-hyo-glossus muscle.

It pours its secretion into the mouth by seven or eight small ducts, which commence by small openings on each side of the frænum linguæ.

Structure.—The salivary are conglomorate glands, consisting of lobes, which are made up of angular lobules, and these of still smaller lobules.

The smallest lobule is apparently composed of granules, which are minute cæcal pouches, formed by the dilatation of the extreme ramifications of the ducts. These minute ducts unite to form lobular ducts, and the lobular ducts constitute by their union a single excretory duct.

The cæcal pouches are connected by cellular tissue, so as to form a minute lobule; the lobules are held together by a more condensed cellular layer; and the larger lobes are enveloped by a dense cellulo-fibrous capsule, which is firmly attached to the deep cervical fascia.

Vessels and Nerves.—The parotid gland is abundantly supplied with *arteries* by the external carotid; the submaxillary, by the facial; and the sublingual, by the sublingual branch of the lingual artery.

The *nerves* of the parotid gland are derived from the auricular branch of the inferior maxillary nerve, from the auricularis magnus, and from the nervi molles of the external carotid artery. The sub-maxillary gland is supplied by the branches of the submaxillary ganglion, and by filaments from the mylo-hy-

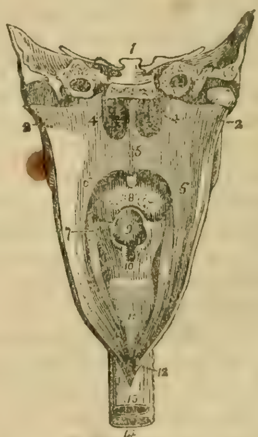
oidean nerve; and the sublingual by filaments from the submaxillary ganglion and gustatory nerve.

PHARYNX.

The pharynx is a musculo-membranous sac, situated upon the cervical portion of the vertebral column, and extending from the base of the skull to a point corresponding with the cricoid cartilage in front, and the fifth cervical vertebra behind. It is composed of mucous membrane, muscles, vessels and nerves, and is invested by a strong fascia, situated between the mucous membrane and muscles, which serves to connect it with the basilar process of the occipital bone and with the petrous portions of the temporal bones. Upon its anterior part it is incomplete, and has opening into it seven foramina, viz:—

Posterior nares, two,
Eustachian tubes, two,
Mouth,
Larynx,
Œsophagus.

PLATE 16.*



The *posterior nares* are the two large openings at the upper and front part of the pharynx. On each side of these openings, and slightly above the posterior termination of the inferior turbinated bone, is the irregular depression in the mucous membrane, marking the entrance of the *Eustachian tube.* Beneath the posterior nares is the large opening into the *mouth*, partly veiled by the soft palate; and, beneath the root of the tongue, the opening of the larynx. The *œsophageal* opening is the lower constricted portion of the pharynx.

Œsophagus.—The œsophagus commences at the termination of the pharynx, opposite the lower border of the cricoid cartilage and fifth cervical vertebra, and descends the neck, behind and rather to the left of the trachea. It then passes behind

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* *The Pharynx laid open from behind.*—1. A section carried transversely through the base of the skull. 2, 2. The walls of the pharynx drawn to each side. 3, 3. The posterior nares, separated by the vomer. 4. The extremity of the Eustachian tube of one side. 5. The soft palate. 6. The posterior pillar of the soft palate. 7. Its anterior pillar; the tonsil is seen situated in the niche between the two pillars. 8. The root of the tongue, partly concealed by the uvula. 9. The epiglottis, overhanging (10) the opening of the glottis. 11. The posterior part of the larynx, 12. The opening into the œsophagus. 13. The external surface of the œsophagus. 14. The trachea.

the arch of the aorta, and along the posterior mediastinum, lying in front of the thoracic aorta, to the œsophageal opening in the diaphragm, where it enters the abdomen, and terminates at the cardiac orifice of the stomach.

THE STOMACH.

The stomach is an expansion of the alimentary canal, situated in the left hypochondriac, and extending into the epigastric region. On account of the peculiarity of its form, it is divided into a *greater*, or *splenic*, and a *lesser*, or *pyloric end*, a *lesser curvature* above, and a *greater curvature* below, a *cardiac orifice* and a *pyloric orifice*. The great end is not only of large size, but expands beyond the point of entrance of the œsophagus. The pylorus is the small and contracted extremity of the organ. The two curvatures give attachment to the peritoneum; the upper curve to the lesser omentum, and the lower to the greater omentum.

Small Intestines.—The small intestine is divisible into three portions, *duodenum*, *jejunum*, and *ileum*.

The *duodenum* is named from being equal in length to the breadth of twelve fingers. Commemcing at the pylorus, it ascends obliquely to the under surface of the liver; it next descends perpendicularly in front of the right kidney, and then passes nearly transversely across the vena cava and aorta, opposite to the third lumbar vertebra. It terminates in the jejunum on the left side of the second lumbar vertebra. The first part of its course is completely enclosed by the peritoneum; the second is in apposition with the peritoneum only in front; and the third lies between the diverging layers of the transverse meso-colon. The transverse portion of the duodenum is crossed by the superior mesenteric artery and vein, and the perpendicular portion is pierced obliquely by the ductus communis choledochus, and pancreatic duct, near to its lower angle.

The *jejunum* is named from being generally found empty. It forms the upper two fifths of the small intestine, commencing at the duodenum on the left side of the second lumbar vertebra, and terminating in the ileum. It is thicker to the touch than the rest of the intestine, and has a pinkish tinge, from containing more mucous membrane than the ileum.

The *ileum* includes the remaining three fifths of the small intestine. It is thinner in texture and paler than the jejunum; but there is no mark by which to distinguish the termination of the one or the commencement of the other. It terminates in the right iliac fossa, by opening into the colon.

Large intestine.—The large intestine is divided into the *cœcum*, *colon*, and *rectum*.

The *cæcum* (blind) is the blind pouch, or cul-de-sac, at the commencement of the large intestine. It is situated in the right

iliac fossa, and is retained in its place by the peritoneum, which passes over its anterior surface; its posterior surface is connected by loose cellular tissue with the iliac fascia. Attached to its extremity is the appendix vermiformis, a long worm-shaped tube, the rudiment of the lengthened cæcum, found in all mammiferous animals except man and the higher quadrumana.

The *colon* is divided into ascending, transverse and descending. The ascending colon passes upwards from the right iliac fossa, through the right lumbar region, to the under surface of the liver. It then bends inwards, and crosses the upper part of the umbilical region under the name of *transverse colon*, and on the left side descends (descending colon,) through the left lumbar region to the left iliac fossa, where it makes a remarkable curve upon itself, which is called the *sigmoid flexure.*

The *rectum* is the termination of the large intestine. It has received its name, not so much from the direction of its course, as from the straightness of its form in comparison with the colon. It descends from opposite the left sacro-iliac symphasis, in front of the sacrum, forming a gentle curve to the right side, and then returning to the middle line. At the lower part of the pelvis it becomes considerably dilated, and near the extremity of the coccyx curves backwards, to terminate at the anus. The rectum, therefore, forms a double flexure in its course, the one being directed from side to side, the other from before backwards.

With reference to its relations, the rectum is divided into three portions; the first, including half its length, extends to about the middle of the sacrum, is completely surrounded by peritoneum, and connected to the sacrum by means of the meso-rectum.

The second portion, about three inches in length, is closely attached to the surface of the sacrum, and covered by peritoneum only in front; it is in relation by its lower part with the base of the bladder, vesiculæ seminales, and the commencement of the prostrate gland.

The third portion curves backwards from opposite the prostrate gland, to terminate at the anus; it is embraced by the levatores ani, and is about one inch and a half in length.

Structure of the Intestinal Canal.—The pharynx has three coats; a mucous coat, a fibrous coat, derived from the pharyngeal fascia, and a muscular layer. The œsophagus has but two coats, the mucous and the muscular. The stomach and intestines have three, *mucous*, *muscular*, and an external *serous* investment, derived from the peritoneum.

Mucous coat.—The mucous membrane of the mouth invests the whole internal surface of that caviity, and is reflected along the parotid, submaxillary, and sublingual ducts, into the cor-

responding glands. It terminates anteriorly upon the outer margin of the red border of the lips, and posteriorly is continuous with the mucous lining of the pharynx. The mucous membrane of the pharynx is continuous with the mucous lining of the Eustachian tubes, the nares, the mouth, and the larynx. In the œsophagus it is disposed in *longitudinal plicæ.* In the stomach it is arranged in *rugæ* (wrinkles), and at the pylorus forms a spiral fold, called the *pyloric valve.* In the lower half of the duodenum, the whole length of the jejunum, and upper part of the ileum, it forms valvular folds, called *valvulæ conniventes.* These folds do not entirely surround the cylinder of the intestine, but extend for about three fourths of its circumference. In the lower half of the ileum, the mucous lining is without folds; hence the thinness of the coats of this intestine, as compared with the jejunum and duodenum. At the termination of the ileum in the cæcum, the mucous membrane forms two folds, which are strengthened by the muscular coat, and project into the cæcum. These are the *ilio-cæcal valve.* In the caæcum and colon the mucous membrane is raised into crescentic folds, which correspond with the sharp edges of the sacculi; and in the rectum it forms three valvular folds, one of which is situated near the commencement of the intestine; the second, extending from the side of the tube, is placed opposite the middle of the sacrum; and the third, which is the largest and most constant, projects from the anterior wall of the intestine opposite the basin of the bladder.

Structure of the Mucous Membrane.—This membrane is analagous to the cutaneous covering of the exterior of the body, and resembles that tissue very closely in its structure. It is composed of three layers, an *epithelium*, a *proper mucous*, and a *fibrous layer.*

The *epithelium* is the cuticle of the mucous membrane. Throughout the pharynx and æsophagus it resembles the cuticle, both in appearance and character. It is continuous with the cuticle of the skin at the margin of the lips, and terminates by an irregular border at the cardiac orifice of the stomach. In the mouth it is composed of laminæ of oval vescicles and thin angular scales, both possessing central nuclei. The vescicles form the deepest layer, and become gradually flattened and condensed as they approach the surface. In the stomach and intestines these bodies are pyriform in shape, and have a columnar arrangement, the apices being applied to the papillary surface of the membrane, and the bases forming, by their approximation, the free intestinal surface. Each column is provided with a central nucleus, which gives its middle a swollen appearance . and, from the transparency of its structure, the nucleus may be seen through the base of the column, when exam-

ined from the surface. Around the circular villi, the columns, from being placed perpendicularly to the surface, have a radiated arrangement.

The *proper mucous* or *papillary layer*, is analagous to the papillary layer of the skin, and, like it, is the secreting structure by which the epithelium is produced. Its surface presents several varieties of appearance, when examined in the different parts of its extent. In the stomach it forms polygonal cells, into the floor of which the gastric follicles open. In the small intestine it presents numerous minute projecting papillæ, called villi. The villi are of two kinds, *cylindrical* and *laminated*, and so abundant as to give to the entire surface a beautiful velvety appearance. In the large intestine, the surface is composed of a fine network of minute polygonal cells, more numerous than those of the stomach, but resembling them in receiving the secretion from the numerous perpendicular follicles into their floors.

The *fibrous layer* (sub-mucous nervous) is the membrane of support to the mucous membrane, as is the corium to the papillary layer of the skin. It gives to the mucous membrane its strength and resistance, is but loosely connected with the mucous layer, but is firmly adherent to the muscular coat, and is called, in the older works on anatomy, the "nervous coat."

In the loose cellular tissue connecting the mucous with the fibrous layer, are situated the glands and follicles belonging to the mucous membrane: these are—the

Œsophageal glands,
Gastric follicles,
Duodenal glands (Brunner's),
Glandulæ solitaræ,
Glandulæ aggregatæ (Peyer's),
Simple follicles (Lieberkuhn's).

The *œsophageal glands* are small lobulated bodies, situated in the submucous tissue, and opening upon the surface of the œsaphagus by a long excretory duct, which passes obliquely through the mucous membrane.

The *gastric follicles* are long tubular follicular glands, situated perpendicularly side by side in every part of the mucous mumbrane of the stomach. At their terminations they are dilated into small lateral pouches, which give them a clustered appearance. This character is more clearly exhibited at the pyloric than at the cardiac end of the stomach. They are intended, very probably, for the secretion of the gastric fluid.

The *duodenal*, or *Brunner's glands*, are small flattened granular bodies, compared collectively to a second pancreas. They resemble in structure the small salivary glands so abundant be-

neath the mucous membrane of the mouth and lips; and, like them, they open upon the surface by minute excretory ducts. They are limited to the duodenum.

The *solitary glands* are of two kinds, those of the small and those of the large intestine. The former are small circular patches, surrounded by a zone or wreath of simple follicles. When opened, they are seen to consist of a small flattened saccular cavity, containing a mucous secretion, but having no excretory duct. They are chiefly found in the lower part of the ileum. The solitary glands of the large intestine are the most abundant in the cæcum and appendix cæci; they are small circular projections, flattened upon the surface, and perforated in the centre by a minute excretory opening.

The *aggregate*, or *Peyer's glands*, are situated near to the lower end of the ileum, and occupy that portion of the intestine which is opposite the attachment of the mesentery. To the naked eye they present the appearance of oval disks, covered with small irregular fissures; but with the aid of the microscope they are seen to be composed of numerous small circular patches, surrounded by simple follicles, like the solitary glands of the small intestine. Each patch corresponds with a flattened and closed sac, situated beneath the membrane, but having no excretory opening, and the interspace between the patches is occupied by laminated villi.

The *simple follicles*, or follicles of Lieberkahn, are small pouches of the mucous layer, dispersed in immense numbers over every part of the mucous membrane.

Muscular coat.—The muscular coat of the pharynx consists of five pairs of muscles, which have been already described. The muscular coat of the rest of the alimentary canal is composed of two planes of fibres, an external *lougitudinal*, and an internal *circular*.

The *œsophagus* is very muscular; its longitudinal fibres are continuous above with the pharynx, and are attached in front to the vertical ridge on the posterior surface of the cricoid cartilage. Below, both sets of fibres are continued upon the stomach. On the stomach, the longitudinal fibres are most apparent along the lesser curve, and the circular at the smaller end. At the pylorus, they are aggregated into a thick circular ring, which, with the spiral fold of mucous membrane, constitutes the *pyloric valve*. At the great end of the stomach a new order of fibres is introduced, having for their object to strengthen that extremity of the organ. They are directed more or less horizontally from the great end towards the lesser end, and are generally lost upon the sides of the stomach, at about its middle; these are the oblique fibres.

The *small intestine* is provided with both layers, equally

distributed over the entire surface. At the termination of the ileum the circular fibres are continued into the two folds of the ilio-cæcal valve, while the longitudinal fibres pass onwards to the large intestine. In the *cæcum* and *colon* these longitudinal fibres are collected into *three bands*, which, being shorter than the intestine, give it the puckered and sacculated appearance which is characteristic of the large intestine. The circular fibres are very thin. In the *rectum* the three longitudinal bands spread out and form a thick and very muscular longitudinal layer.

The circular fibres are very much attenuated, excepting at its lower extremity, where they are aggregated into the thick muscular ring which is called the internal sphincter ani.

Serous coat.—The pharynx and œsophagus have no covering of serous membrane. The alimentary canal within the abdomen has a serous layer, derived from the peritoneum.

The *stomach* is completely surrounded by the peritoneum. The *first* or *oblique portion of the duodenum* is also completely included by the serous membrane. The *descending portion* has merely a partial covering on its anterior surface. The *transverse portion* is also behind the peritoneum, being situated between the two layers of the transverse meso-colon, and has but a partial covering. The rest of the small intestines are completely invested by it. The *cæcum* and *commencement of the colon* have the serous membrane only on their anterior two thirds ; to the rest of the colon it forms a complete covering. The upper third of the rectum is completely enclosed by the peritoneum ; the middle third has an anterior covering only, and the inferior third none whatsoever.

The expression complete covering, in the above description, must be received with limitation. No peritoneal investment can be perfectly complete, as a certain space must necessarily be left uncovered in every viscus for the entrance and exit of vessels. This interval corresponds with the point of reflection of the serous membrane.

Vessels and *nerves.* The *arteries* of the alimentary canal, as they supply the tube from above downwards, are the ascending pharyngeal, superior thyroid, and inferior thyroid in the neck ; œsophageal in the thorax ; gastric, hepatic, splenic, superior and inferior mesenteric in the abdomen ; and inferior mesenteric, iliac, and internal pudic in the pelvis. The *veins* from the abdominal alimentary canal unite to form the vena portæ. The *lymphatics* and *lacteals* open into the thoracic duct.

The *nerves* of the pharynx and œsophagus are derived from the glosso-pharyngeal, pneumogastric, and sympathetic. The nerves of the stomach are the pneumogastric and sympathetic

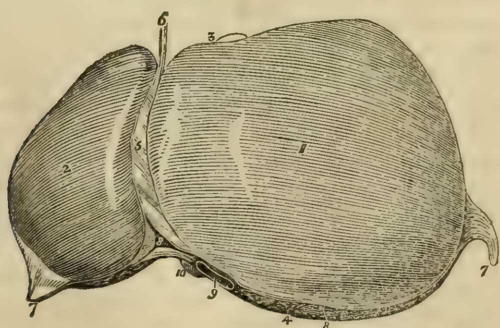
branches from the solar plexus; and those of the intestinal canal are the superior and inferior mesenteric and hypogastric plexuses. The extremity of the rectum is supplied by the coccygeal nerves from the spinal cord.

THE LIVER.

The liver is a conglomerate gland of large size, appended to the alimentary canal, and performing the double office of separating impurities from the venous blood of the chylo-poietic viscera previous to its return into the general venous circulation, and of secreting a fluid necessary to chylification—the bile. It is the largest organ in the body, weighing about four pounds, and measuring through its longest diameter about twelve inches. It is situated in the right hypochondriac region, and extends across the epigastrium into the left hypochondriac, frequently reaching by its left extremity to the upper end of the spleen. It is placed obliquely in the abdomen, its convex surface looking upwards and forwards, and the concave downwards and backwards. The anterior border is sharp and free, and marked by a deep notch, and the posterior rounded and broad. It is in relation, superiorly and posteriorly with the diaphragm, and inferiorly with the stomach, ascending portion of the duodenum, transverse colon, right supra-renal capsule, and right kidney, and corresponds by its free border with the lower margin of the ribs.

The liver is retained in its place by five ligaments; four of which are formed by duplicatures of the peritoneum, and are

PLATE 17*.



* *The Upper Surface of the Liver.*—1. The right lobe. 2. The left lobe. 3. The anterior or free border. 4. The posterior or rounded border. 5. The broad ligament. 6. The round ligament. 7, 7. The two lateral ligaments. 8, 8. The space left uncovered by the peritoneum, and surrounded by the coronary ligament. 9. The inferior vena cava. 10. The point of the lobus Spigelii.

situated upon the convex surface of the organ; the fifth being a fibrous cord which passes through a fissure in its under surface, from the umbilicus to the inferior vena cava. They are—the

Longitudinal,
Two lateral,
Coronary,
Round.

The *longitudinal ligament* is an antero-posterior fold of peritoneum, extending from the notch on the anterior margin of the liver to its posterior border. Between its two layers in the anterior and free margin, is the round ligament.

The two *lateral ligaments* are fomerd by the two layers of peritoneum which pass from the under surface of the diaphragm to the posterior border of the liver; they correspond with its lateral lobes.

The *coronary ligament* is formed by the separation of the two layers forming the lateral ligaments near their point of convergence. The posterior layer is continued unbroken from one lateral ligament into the other, but the anterior quits the posterior at each side, and is continuous with the corresponding layer of the longitudinal ligament. In this way a large oval surface on the posterior border of the liver is left uncovered by peritoneum, and is connected to the diaphragm by a dense cellular tissue. This space is formed principally by the right lateral ligament, and is pierced near its left extremity by the inferior vena cava, previously to the passage of that vessel through the tendinous opening in the diaphragm.

The *round ligament* is a fibrous cord resulting from the obliteration of the umbilical vein, and situated between the two layers of peritoneum in the anterior border of the longitudinal ligament. It may be traced from the umbilicus, along the longitudinal fissure upon the under surface of the liver to the inferior vena cava to which it is connected.

The under surface of the liver is marked by five fissures, which divide its surface into five compartments or lobes, two principal and three minor lobes: they are—the

Fissures.	*Lobes.*
Longitudinal fissure,	Right lobe,
Fissure for the ductus venosus,	Left lobe,
Transverse fissure,	Lobus quadratus,
Fissure for the gall bladder,	Lobus Spigelii,
Fissure for the vena cava.	Lobus caudatus.

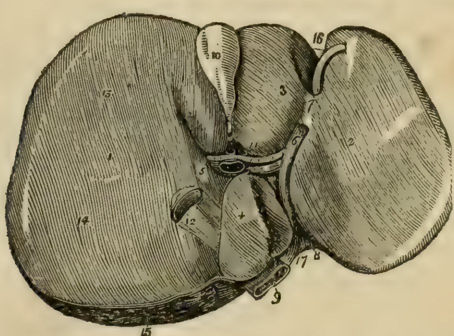
The *longitudinal fissure* is a deep groove running from the notch upon the anterior margin of the liver, to the posterior border of the organ. At about one third from its posterior extremity it is joined by a short but deep fissure, the transverse, which meets it transversely from the under part of the right lobe.

The longitudinal fissure in front of this junction lodges the fibrous cord of the umbilical vein, and is generally crossed by a band of hepatic substance called the pons hepatis.

The *fissure for the ductus venosus* is the shorter portion of the longitudinal fissure, extending from the junctional termination of the transverse fissure to the posterior border of the liver, and containing a small fibrous cord, the remains of the ductus venosus. This fissure is therefore but a part of the longitudinal fissure.

The *transverse fissure* is the short and deep fissure, about two inches in length, through which the hepatic ducts, hepatic artery, and portal vein, enter the liver. Hence this fissure was considered by the older anatomists as the gate (porta) of the liver; and the large vein entering the organ at this point, the portal vein. At their entrance into the transverse fissure, the

PLATE 18.*



* *The Under Surface of the Liver.*—1. The right lobe. 2. The left lobe. 3. The lobus quadratus. 4. The lobus Spigelii. 5. The lobus caudatus. 6. The longitudinal fissure, in which is seen the rounded cord, the remains of the umbilical vein. 7. The pons hepatis. 8. The fissure for the ductus venosus; the obliterated cord of the ductus is seen passing backwards to be attached to the coats of the inferior vena cava (9). 10. The gall bladder, lodged in its fossa. 11. The transverse fissure, containing from before backwards, the hepatic duct, hepatic artery, and portal vein. 12. The vena cava. 13. A depression corresponding with the curve of the colon. 14. A double depression produced by the right kidney and its supra-renal capsule. 15. The rough surface on the posterior border of the liver left uncovered by peritoneum; the cut edge of peritoneum, bounding it anteriorly, forms part of the coronary ligament. 16. The notch on the anterior border, separating the two lobes. 17. The notch on the posterior border, corresponding with the vertebral column.

branches of the hepatic duct are the most anterior, next those of the artery, and most posteriorly the portal vein.

The *fissure for the gall-bladder* is a shallow fossa extending forwards parallel with the longitudinal fissure from the right extremity of the transverse fissure to the free border of the liver, where it frequently forms a notch.

The *fissure for the vena cava* is a deep and short fissure occasionally a rounded tunnel, which proceeds from a little behind the right extremity of the transverse fissure to the posterior border of the liver, and lodges the inferior vena cava.

These five fissures taken collectively resemble an inverted Y, the base corresponding with the free margin of the liver, and the apex with its posterior border. Viewing them in this way, the two anterior branches represent the longitudinal fissure on the left, and the fissure for the gall-bladder on the right side; the two posterior, the fissure for the ductus venosus on the left, and the fissure for the vena cava on the right side, and the connecting bar the transverse fissure.

Lobes.—The *right lobe* is four or six times larger than the left, from which it is separated on the concave surface by the longitudinal fissure, and on the convex by the longitudinal ligament. It is marked upon its under surface by the transverse fissure, and by the fissures for the gall-bladder and vena cava, and presents three depressions, one in front for the curve of the ascending colon, and two behind for the right supra-renal capsule, and kidney.

The *left lobe* is small and flattened, convex upon its upper surface, and concave below, where it lies in contact with the anterior surface of the stomach. It is sometimes in contact by its extremity with the upper end of the spleen, and is in relation by its posterior border with the cardiac orifice of the stomach, and left pneumogastric nerve.

The lobus quadratus is a quadrilateral lobe situated upon the under surface of the right lobe: it is bounded *in front* by the free border of the liver; *behind*, by the transverse fissure; to the *right*, by the gall bladder: and to the *left*, by the longitudinal fissure.

The *lobus Spigelii* is a small triangular lobe, also situated upon the under surface of the right lobe; it is bounded *in front* by the transverse fissure; and *on the sides*, by the fissures for the ductus venosus and vena cava.

The *lobus caudatus* is a small tail-like appendage to the lobus Spigelii, from which it runs outwards like a crest into the right lobe, and serves to separate the right extremity of the transverse fissure from the commencement of the fissure for the vena cava. In some livers this lobe is extremely well marked, in others it is small and ill-defined.

Reverting to the comparison of the fissures with an inverted V, it will be observed that the quadrilateral interval, in front of the transverse bar, represents the lobus quadratus; the triangular space behind the bar, the lobus Spigelii; and the apex of the letter, the point of union between the inferior vena cava, and the remains of the ductus venosus.

The *vessels* entering into the structure of the liver are also *five* in number; they are, the

Hepatic artery,
Portal vein,
Hepatic veins,
Hepatic ducts,
Lymphatics.

The *hepatic artery*, *portal vein*, and *hepatic duct* enter the liver at the transverse fissure, and ramify through portal canals to every part of the organ. So that their general direction is from below upwards, and from the centre towards the circumference.

The *hepatic veins* commence at the circumference and proceed from before backwards, to open into the vena cava, on the posterior border of the liver. Hence the branches of the two veins cross each other in their course.

The portal vein, hepatic artery, and duct are moreover enveloped in a loose cellular tissue, the capsule of Glisson, which permits them to contract upon themselves when emptied of their contents; the hepatic veins, on the contrary, are closely adherent by their parietes to the surface of the canals in which they run, and are unable to contract. By these characters the anatomist is enabled, in any section of the liver, to distinguish at once the most minute branch of the portal vein from the hepatic vein: the former will be found more or less collapsed, and always accompanied by an artery and duct, and the latter widely open and solitary.

The *lymphatics* are described in the portion dedicated to those vessels.

The *nerves* of the liver are derived from the systems both of animal and of organic life; the former proceed from the right phrenic and pneumogastric nerves, and the latter from the hepatic plexus.

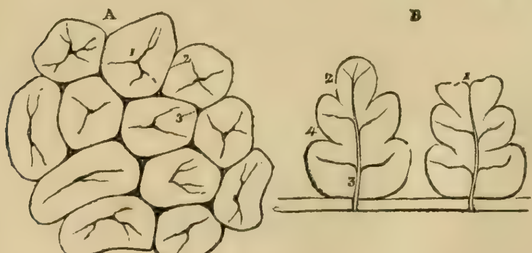
Structure and minute Anatomy of the Liver, according to Mr. Kiernan.

The *liver* is composed of *lobules*, of a connecting medium, called *Glisson's capsule*, of the ramifications of the *portal vein*, *hepatic duct*, *hepatic artery*, *hepatic veins*, *lymphatics*, and *nerves*, and is enclosed and retained in its proper situation by the peritoneum.

The *lobules* are small granular bodies, of about the size of a millet seed, of an irregular form, and presenting a number of rounded projecting processes upon their surface. When divided longitudinally, they have a foliated appearance, and transversely, a polygonal outline, with sharp or rounded angles, according to the smaller or greater quantity of Glisson's capsule contained in the liver.

Each lobule is divided upon its exterior into a base and a capsular surface. The *base* corresponds with one extremity of the lobule, is flattened, and rests upon a hepatic vein, which is thence named *sublobular*. The *capsular surface* includes the rest of the periphery of the lobule, and has received its designation from being enclosed in a cellular capsule derived from the capsule of Glisson. In the centre of each lobule is a small vein, the *intralobular*, which is formed by the convergence of six or eight minute venules from the rounded processes situated upon the surface. The intralobular vein thus constituted, takes its course through the centre of the longitudinal axis of the lobule, pierces the middle of its base, and opens into the sublobular vein. The circumference of the lobule, with the exception of its base, which is always closely attached to a sublobular vein, is connected by means of its cellular capsule with the capsular surfaces of surrounding lobules. The cellular interval between the lobules is the *interlobular fissure*, and the angular interstices formed by the apposition of several lobules are the *interlobular spaces*.

PALTE 19.*



* *The Lobules of the Liver.*—A. The lobules as they are seen upon the surface of the liver, or when divided transversely. 1. The intralobular vein in the centre of each lobule. 2. The interlobular fissure. 3. The interlobular space. B. A longitudinal section of two lobules. 1. A superficial lobule, terminating abruptly, and resembling a section at its extremity. 2. A deep lobule, showing the foliated appearance of its section. 3. The intralobular vein, with its converging venules: the vein terminates in a sublobular vein. 4. The external or capsular surface of the lobule.

The lobules of the centre of the liver are angular, and somewhat smaller than those of the surface, from the greater compression to which they are submitted. The superficial lobules are incomplete, and give to the surface of the organ the appearance and all the advantages resulting from an examination of a transverse section.

Each lobule is composed of a plexus of biliary ducts, of a venous plexus, formed by branches of the portal vein, of a branch (intralobular) of an hepatic vein, and of minute arteries; nerves and absorbents, it is to be presumed, also enter into their formation, but cannot be traced into them. Examined with the microscope, a lobule is apparently composed of numerous minute bodies of a yellowish color, and of various forms, connected with each other by vessels. These minute bodies are the *acini* of Malpighi. If an uninjected lobule be examined and contrasted with an injected lobule, it will be found that the acini of Malpighi in the former are identical with the injected lobular biliary plexus in the latter, and the blood-vessels in both will be easily distinguished from the ducts.

Glisson's capsule is the cellular tissue which envelopes the hepatic artery, portal vein, and hepatic duct, during their passage through the right border of the lesser omentum, and which continues to surround them to their ultimate distribution in the substance of the lobules. It forms for each lobule a distinct capsule, which invests it on all sides with the exception of its base, connects all the lobules together, and constitutes the proper capsule of the entire organ. But "Glisson's capsule," observes Mr. Kiernan, "is not mere cellular tissue; it is to the liver what the pia mater is to the brain; it is a cellulo-vascular membrane in which the vessels divide and subdivide to an extreme degree of minuteness; which lines the portal canals, forming sheaths for the larger vessels contained in them, and a web in which the smaller vessels ramify; which enters the interlobular fissures, and with the vessels forms the capsules of the lobules; and which finally enters the lobules, and with the blood vessels expands itself over the secreting biliary ducts." Hence arises a natural division of the capsule into three portions, a *vaginal*, an *interlobular*, and a *lobular portion*.

The vaginal portion is that which invests the hepatic artery, hepatic duct, and portal vein, in the portal canals; in the larger canals it completely surrounds these vessels, but in the smaller is situated only on that side which is occupied by the artery and duct. The interlobular portion occupies the interlobular fissures and spaces, and the lobular portion forms the supporting tissue to the substance of the lobules.

The *portal vein*, entering the liver at the transverse fissure, ramifies through its structure in canals which resemble, by their

surfaces, the external superficies of the liver, and are formed by the capsular surfaces of the lobules,—"all their canals being," as it were, "tubular inflections inwards of the superfices of the liver." These are the portal canals, and contain, besides the portal vein with its ramifications, the artery and duct with their branches.

In the larger canals, the vessels are separated from the parietes of the cavity by a web of Glisson's capsule; but, in the smaller, the portal vein is in contact with the surface of the canal for about two-thirds of its cylinder, the opposite third being in relation with the artery and duct and their investing capsule. If, therefore, the portal vein were laid open by a longitudinal incision in one of these smaller canals, the coats being transparent, the outline of the lobules, bounded by their interlobular fissures, would be as distinctly seen as upon the external surface of the liver, and the smaller venous branches would be observed entering the interlobular spaces.

The branches of the portal vein are, the vaginal, interlobular, and lobular. The *vaginal branches* are those which, being given off in the portal canals, have to pass through the sheath (vagina) of Glisson's capsule, previously to entering the interlobular spaces. In this course they form an intricate plexus, the *vaginal plexus*, which, depending for its existence on the capsule of Glisson, necessarily surrounds the vessels, as does that capsule in the larger canals, and occupies the capsular side only in the smaller canals. The *interlobular branches* are given off from the vaginal portal plexus where it exists, and directly from the portal veins, in that part of the smaller canals where the coats of the vein are in contact with the walls of the canal. They then enter the interlobular spaces and divide into branches, which cover with their ramifications every part of the surface of the lobules with the exception of their bases, and those extremities of the superficial lobules which appear upon the surfaces of the liver. The interlobular veins communicate freely with each other, and with the corresponding veins of adjoining fissures, and establish a general portal anastomosis throughout the entire liver. The *lobular branches* are derived from the interlobular veins; they form a plexus within each lobule, and converge from the circumference towards the centre, where they terminate in the minute radicles of the intralobular vein. This plexus, interposed between the interlobular portal veins and the intralobular hepatic vein, constitutes the venous part of the lobule, and may be called the *lobular venous plexus*. The irregular islets of the substance of the lobules, seen between the meshes of this plexus by means of the microscope, are the acina of Malpighi, and are shown by Mr. Kiernan to be portions of the lobular biliary plexus.

The portal vein returns the venous blood from the chylopoietic viscera, to be circulated through the lobules; it also receives the venous blood which results from the distribution of the hepatic artery.

The *hepatic duct*, entering the liver at the transverse fissure, divides into branches, which ramify through the portal canals, with the portal vein and hepatic artery, to terminate in the substance of the lobules. Its branches, like those of the portal vein, are vaginal, interlobular and lobular.

The *vaginal branches* ramify through the capsule of Glisson, and form a *vaginal biliary plexus*, which, like the vaginal portal plexus, surrounds the vessels in the large canals, but is deficient on that side of the smaller canals near which the duct is placed. The branches given off by the vaginal biliary plexus, are interlobular and lobular. The *interlobular branches* proceed from the vaginal biliary plexus where it exists, and directly from the hepatic duct on that side of the smaller canals against which the duct is placed. They enter the interlobular spaces, and ramify upon the capsular surface of the lobules, in the interlobular fissures, where they communicate freely with each other. The *lobular ducts* are derived chiefly from the interlobular; but to those lobules forming the walls of the portal canals, they pass directly from the vaginal plexus. They enter the lobule and form a plexus in its interior, the *lobular biliary plexus*, which constitutes the principal part of the substance of the lobule. The ducts terminate most probably in cæcal extremities.

The coats of the ducts are very vascular, and supplied with a number of mucous follicles, which are distributed irregularly in the larger, but are arranged in two parallel longitudinal rows in the smaller ducts.

The *hepatic artery* enters the liver with the portal vein and hepatic duct, and ramifies with those vessels through the portal canals. Its branches are the vaginal, interlobular and lobular. The *vaginal branches*, like those of the portal vein and hepatic duct, form a *vaginal plexus*, which exists throughout the whole extent of the portal canals, with the exception of that side of the smaller canals which corresponds with the artery. The *interlobular branches*, arising from the vaginal plexus and from the parietal side of the artery in the smaller canals, ramify through the interlobular fissures, and are principally distributed to the coats of the interlobular ducts.

"From the superficial interlobular fissures, small arteries emerge, and ramify in the *proper capsule*, on the convex and concave surface of the liver, and in the ligaments. These are the *capsular arteries*." Where the capsule is well developed, "these vessels cover the surfaces of the liver with a beautiful

plexus," and "anastomose with branches of the phrenic, internal mammary, and supra-renal arteries," and with the epigastric.

The *lobular branches*, extremely minute and few in number, are the nutrient vessels of the lobules, and terminate in the lobular venous plexus.

All the venous blood resulting from the distribution of the hepatic artery, even that from the vasa vasorum of the hepatic veins, is returned into the portal vein.

The *hepatic veins* commence in the substance of each lobule by minute venules, which receive the blood from the lobular venous plexus, and converge to form the intralobular vein. The *intralobular vein* passes through the central axis of the lobule, and through the middle of its base, to terminate in a sublobular vein; and the union of the sublobular veins constitutes the hepatic trunks, which terminate in the inferior vena cava. The hepatic venous system consists, therefore, of three sets of vessels; intralobular veins, sublobular veins, and hepatic trunks.

The *sublobular veins* are contained in canals formed solely by the bases of the lobules, with which, from the absence of Glisson's capsule, they are in immediate contact. Their coats are thin and transparent; and, if they be laid open by a longitudinal incision, the bases of the lobules will be distinctly seen, separated by interlobular fissures, and perforated through the centre by the opening of the intralobular vein.

The *hepatic trunks* are formed by the union of the sublobular veins; they are contained in canals (hepatic venous) similar in structure to the portal canals, and lined by a prolongation of the proper capsule. They proceed from before backwards, and terminate by two large openings, corresponding to the right and left lobe of the liver in the inferior vena cava.

It is to Kiernan that anatomical science is indebted for the clear, distinct, and intelligible idea of the structure of this most complicated organ, which has been furnished by the researches of that anatomist. To value this knowledge as it deserves, we have but to reflect upon the unsuccessful, though not fruitless, labors of those great discoverers in structural anatomy, Malpighi and Ruysch, upon the same subject. It is not, however, in an anatomical, or even a physiological point of view merely, that we have to admire these discoveries; for in their practical application to the elucidation of pathological appearances, and the explanation of the phenomena of disease, they are still more interesting.

Summary.—The liver has been shown to be composed of *lobules*; the lobules (excepting their bases) are invested and connected together, the vessels supported, and the whole organ

enclosed by *Glisson's capsule;* and they are so arranged, that the base of every lobule in the liver is in contact with an hepatic vein (sublobular).

The *portal vein* distributes its numberless branches through portal canals, which are channelled through every part of the organ; it brings the returning blood from the chylopoietic viscera; it collects also the venous blood from the ultimate ramifications of the hepatic artery in the liver itself. It gives off branches in the canals, which are called *vaginal*, and form a venous *vaginal plexus;* these give off *interlobular branches*, and the latter enter the lobules and form *lobular venous plexuses*, from the blood circulating in which the bile is secreted.

The *bile* in the lobule is received by a network of minute ducts, the *lobular biliary plexus;* it is conveyed from the lobule into the *interlobular ducts;* it is thence poured into the biliary *vaginal plexus* of the portal canals, and thence into the excreting ducts, by which it is carried to the duodenum and gall-bladder, after being mingled in its course with the mucous secretion from the numberless muciparous follicles in the walls of the ducts.

The *hepatic artery* distributes branches through every portal canal; gives off *vaginal branches*, which form a vaginal hepatic plexus, from which the *interlobular branches* arise, and these latter terminate ultimately in the lobular venous plexuses of the portal vein. The artery ramifies abundantly in the coats of the hepatic ducts, enabling them to provide their mucous secretion; and supplies the vasa vasorum of the portal and hepatic veins, and the nutrient vessels of the entire organ.

The *hepatic veins* commence in the centre of each lobule by minute radicles, which collect the impure blood from the lobular venous plexus and convey it into the *intralobular veins*, and the sublobular veins unite to form the large hepatic trunks by which the blood is conveyed into the vena cava.

The physiological deduction arising out of this anatomical arrangement is, that the *bile is wholly secreted from venous blood*, and not from a mixed, venous and arterial blood; for although the portal vein receives its blood from two sources, viz. from the chylopoietic viscera and from the capillaries of the hepatic artery, yet the very fact of the blood of the latter vessel having passed through its capillaries into the portal vein, or in extremely small quantity into the capillary network of the lobular venus plexus, is sufficient to establish its venous character.

The pathological deductions depend upon the following facts: Each lobule is a perfect gland, of uniform structure, of uniform color, and possessing the same degree of vascularity throughout. It is the seat of a double venous circulation, the vessels of

the one (hepatic) being situated in the centre of the lobule, and those of the other (portal) in the circumference. Now the color of the lobule, as of the entire liver, depends chiefly upon the proportion of blood contained in these two sets of vessels; and so long as the circulation is natural, the color will be uniform. But the instant that any cause is developed which shall interfere with the free circulation of either, there will be an immediate diversity in the color of the lobule.

Thus, if there be any impediment to the free circulation of the venous blood through the heart or lungs, the circulation in the hepatic veins will be retarded, and the sublobular and the intralobular veins will become congested, giving rise to a more or less extensive redness in the centre of each of the lobules, while the marginal or non-congested portion presents a distinct border of a yellowish white, yellow, or green color, according to the quantity and quality of the bile it may contain. This is *passive congestion* of the liver, the usual and natural state of the organ after death; and, as it commences with the hepatic vein, it may be called the first stage of *hepatic venous* congestion.

But if the causes which produced this state of congestion continue, or be from the beginning of a more active kind, the congestion will extend through the lobular venous plexuses into those branches of the portal vein situated in the *interlobular fissures*, but not to those in the *spaces*, which, being larger, and giving origin to those in the fissures, are the last to be congested. In this second stage, the liver has a mottled appearance; the noncongested substance is arranged in isolated, circular, and ramose patches, in the centres of which the spaces and parts of the fissures are seen. This is an extended degree of *hepatic venous congestion*; it is *active congestion* of the liver, and very commonly attends diseases of the heart and lungs.

There is another form of partial venous congestion, which commences in the portal vein; this is, therefore, *portal venous congestion*. It is of very rare occurrence, and Mr. Kiernan has observed it in children only. In this form, the congested substance never assumes the deep red color which characterizes hepatic venous congestion; the interlobular fissures and spaces, and the marginal portions of the lobules, are of a deeper color than usual; the congested substance is continuous and cortical, the noncongested substance being medullary, and occupying the centres of the lobules. The second stage of hepatic venous congestion, in which the congested substance appears, but is not cortical, may be easily confounded with portal venous congestion.

These are instances of *partial congestion*, but there is some-

times *general congestion* of the organ. In general congestion the whole liver is of a red color, but the central portions of the lobules are usually of a deeper hue than the marginal portions.

GALL-BLADDER.

The gall-bladder is the reservoir for the bile; it is a pyriform sac, situated in a fossa, upon the under surface of the right lobe of the liver, and extending from the right extremity of the transverse fissure to its free margin. It is divided into a body, fundus, and neck—the fundus, or broad extremity in the natural position of the liver, is placed downwards, and frequently projects beyond the free margin of the liver, while the neck, small and constricted, is directed upwards. This sac is composed of three coats, serous, fibrous, and mucous. The *serous* coat is partial, is derived from the peritoneum, and covers that side only which is unattached to the liver. The *middle* or *fibrous* coat is a thin but strong cellulo-fibrous layer, intermingled with tendinous fibres. It is connected by one side to the liver, and by the other to the peritoneum. The *internal* or *mucous* coat is but loosely connected with the fibrous layer; it is everywhere raised into minute rugæ, which give it a beautifully reticulated appearance, and forms at the neck of the sac a spiral valve.

It is continuous through the hepatic duct with the mucous membrane, lining all the ducts of the liver, and through the ductus communis choledochus, with the mucous membrane of the ailmentary canal.

The *biliary ducts* are the ductus communis choledochus, the cystic and the hepatic duct.

The *ductus communis choledochus* is the common excretory duct of the liver and gall-bladder; it is about three inches in length, and commences upon the papilla, situated on the inner side of the cylinder of the perpendicular portion of the duodenum. Passing obliquely between the mucous and muscular coats, it ascends behind the duodenum, and through the right border of the lesser omentum, and divides into two branches, the cystic duct and hepatic duct. It is constricted at its commencement in the duodenum, and becomes dilated in its progress upwards.

The *cystic duct*, about an inch in length, passes outwards to the neck of the gall-bladder, with which it is continuous.

The *hepatic duct* continues onwards to the transverse fissure of the liver, and divides into two branches, which ramify through the portal canals to every part of the liver.

The *coats* of the hepatic ducts are an external or fibrous, and an internal or mucous.

The *external* coat is composed of a contractile fibrous tissue,

which is probably muscular; but its muscularity has not yet been demonstrated in the human subject.

The *mucous* coat is continuous on the one hand with the lining membrane of the hepatic ducts and gall-bladder, and on the other with that of the duodenum.

Vessels and *nerves.*—The gall-bladder is supplied with blood by the cystic artery, a branch of the hepatic. Its veins return their blood into the portal vein. The nerves are derived from the hepatic plexus.

THE PANCREAS.

The *pancreas* is a long, flattened, conglomerate gland, analogous to the salivary glands; it is situated transversely across the posterior wall of the abdomen, behind the stomach, and resting upon the aorta, vena portæ, inferior vena cava, and the origin of the superior mesenteric artery, opposite to the second lumbar vertebra. It is divided into a body, and a greater and a smaller extremity; the great end or head is placed towards the right, and is surrounded by the curve of the duodenum; the lesser end extends to the left nearly as far as the spleen; along its upper border is the splenic artery and vein, and it is separated from the transverse portion of the duodenum below by the superior mesenteric artery and portal vein.

In structure, it is composed of reddish yellow angular lobules; these consist of smaller lobules, and these latter are made up of the arborescent ramifications of minute ducts, terminating in cæcal pouches.

The pancreatic duct commences at the papilla upon the inner surface of the perpendicular portion of the duodenum, close to the origin, and sometimes in common with the ductus communis choledochus, and passing obliquely between the mucous and muscular coats, runs from right to left through the middle of the gland, lying nearer to its anterior than to its posterior surface. At about the commencement of the apicial third of its course, it divides into two parallel terminal branches. It gives off numerous small branches, which are distributed through the lobules, and constitute by their ramifications the substance of the gland. One of these branches, larger than the rest, receives the secretion from the head of the pancreas, and pours it into the pancreatic duct, near to the duodenum. It has been named the *ductus pancreaticus minor.*

Vessels and *nerves.*—The arteries of the pancreas are branches of the splenic, hepatic, and superior mesenteric; the veins open into the splenic vein; the lymphatics terminate in the lumbar glands. The nerves are filaments of the splenic plexus.

THE SPLEEN.

The *spleen* is an oblong, flattened organ, of a dark bluish red color, situated in the left hypochondriac region. The external surface is convex, the internal slightly concave, and indented along the middle line, for the entrance and exit of vessels; this is the *hilus lienis*. The upper extremity is somewhat larger than the lower, and rounded; the inferior is flattened; the posterior border is obtuse; the anterior is sharp and marked by several notches.

The spleen is in relation, by its external or convex surface with the diaphragm, by its concave surface with the great end of the stomach, by its upper end with the diaphragm, and sometimes with the extremity of the left lobe of the liver, and by its lower end with the anterior surface of the left kidney. It is connected to the stomach by the gastro-splenic omentum and the vessels contained in that duplicature. A second spleen is sometimes found suspended to one of the branches of the splenic artery, near to the great end of the stomach: when it exists, it is round and of very small size, rarely larger than a hazle-nut.

The spleen is invested by the peritoneum, and by a *tunica propria* of yellow elastic tissue, which enables it to yield to the greater or less distension of its vessels. The elastic tunic forms sheaths for the vessels in their ramifications through the organ, and from these sheaths small fibrous bands are given off in all directions, which become attached to the internal surface of the elastic tunic, and constitute the cellular framework of the spleen. The substance occupying the interspaces of this tissue is soft and granular, and of a bright red color; in animals it is interspersed with small white soft corpuscules.

Vessels and *nerves*.—The *splenic artery* is of very large size in proportion to the bulk of the spleen; it is a division of the cœliac axis. The *splenic vein* returns its blood into the portal vein. The *lymphatics* are remarkable for their number and large size, and terminate in the lumbar glands. The *nerves* are the splenic plexus, derived from the solar plexus.

THE SUPRA-RENAL CAPSULES.

The *supra-renal capsules* are two small yellowish and flattened bodies, surmounting the kidneys, and inclining inwards towards the vertebral column. The right is somewhat three cornered in shape, the left more semilunar; they are connected to the kidneys by the common investing cellular tissue, and each capsule is marked upon its anterior surface by a fissure which appears to divide it into two lobes. They are larger in the fœtus than in the adult, and appear to perform some office connected with embryonic life.

In structure, it is composed of two substances, cortical and medullary. The cortical substance is of a yellowish color, and consists of straight parallel fibres, placed perpendicularly side by side. The medullary substance is generally of a dark brown color, double the quantity of the yellow substance, soft in texture, and contains within its centre the trunk of a large vein, the vena supra-renalis. It is the large size of this vein that gives to the fresh supra-renal capsule the appearance of a central cavity; the dark colored pulpy or fluid contents of the capsule at a certain period after death, are produced by softening of the medullary substance.

Dr. Nagle has shown, that the appearance of straight fibres in the cortical substance is caused by the direction of a plexus of capillary vessels. Of the numerous minute arteries, supplying the supra-renal capsule, he says, the greater number enter the cortical substance at every point of its surface, and, after proceeding for scarcely half a line in its substance, divide into a plexus of straight capillary vessels. Some few of the small arteries pierce the cortical layer, and give off several branches in the medullary substance, which proceed in different directions, and re-enter the cortical layer, to divide into a capillary plexus in a similar manner with the preceding. From the capillary plexus composing the cortical layer, the blood is received by numerous small veins which form a venous plexus in the medullary substance, and terminate at acute angles in the large central vein.

Vessels and *nerves.*—The supra-renal *arteries* are derived from the aorta, from the renal, and from the phrenic arteries; they are remarkable for the innumerable minute arteries into which they divide previously to entering the capsule. The *supra-renal vein*, collecting the blood from the medullary venous plexns, and receiving several branches which pierce the cortical layer, opens directly into the vena cava on the right side, and into the renal vein on the left.

The *lymphatics* are large and very numerous; they terminate in the lumbar glands. The *nerves* are derived from the renal and from the phrenic plexus.

THE KIDNEYS.

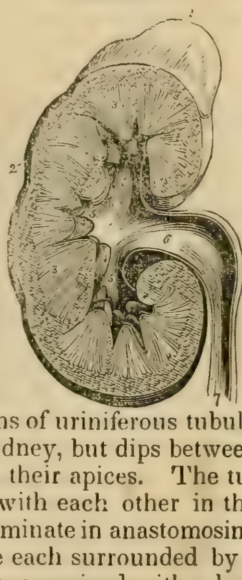
The *kidneys* are situated in the lumbar regions, behind the peritoneum, and on each side of the vertebral column, which they approach by their upper extremities. They are usually enclosed in a quantity of fat, and rest upon the diaphragm and the anterior lamella of the transversalis muscle, which separates them from the quadratus lumborum.

The *right* kindey is somewhat lower than the left, from the position of the liver, and is in relation by its anterior surface

with the liver and descending portion of the duodenum which rest upon it, and is covered in by the ascending colon and by its flexure.

The *left* kidney, higher than the right, is covered in front by the spleen, descending colon with its flexure, and by a portion of the small intestines. The convex border of the kidney is turned outwards, towards the parietes of the abdomen; the concave border looks inwards towards the vertebral colnmn, and is excavated by a deep fissure—the *hilus renalis*—in which are situated the vessels and nerves and pelvis of the kidney, the renal vein being the most anterior, next the renal artery, and lastly the pelvis.

PLATE 20.*



The kidney is invested by a proper fibrous capsule, which is easily torn from its surface. When divided by a longitudinal incision, carried from the convex to the concave border, it presents in its interior two structures, an external or vascular (cortical) and an internal or tubular (medullary) substance. The *tubular* portion is formed of pale reddish colored conical bodies, corresponding by their bases with the vascular structure, and by their apices with the hilus of the organ.—These bodies are named cones, and are from eight to fifteen in number. The *vascular* portion is composed of blood vessels, and of the plexiform convolutions of uriniferous tubuli, and not only forms the surface of the kidney, but dips between the cones and surrounds them nearly to their apices. The tubuli uriniferi communicate frequently with each other in the vas cular structure of the kidney, and terminate in anastomosing loops and cæcal extremities. They are each surrounded by a fine network of capillary vessels. When examined with a lens of low power, a multitude of small globular bodies (glomeruli) are seen to be interspersed through the vascular structure of the organ, and to be connected to the minute twigs of the arteries. They are about one 130th of an inch in diameter, are composed of an aggregated plexus of capillary vessels, and enclose a small central cavity, the use of which is as yet unknown.

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* *A Section of the Kidney*—surmounted by the supra-renal capsule. 1. The supra-renal capsule. 2. The vascular portion. 3, 3. Its tubular portion, consisting of cones. 4, 4. Two of the calices, rceiving the apex of their corresponding cones. 5, 5, 5. The three infundibula. 6. The pelvis. 7. The ureter.

The *cones* are composed of minute straight tubuli uriniferi, of about the diameter of a fine hair; they divide into parallel branches in their course, and commence by minute openings upon the apex or papilla of each cone. The papillæ are invested by mucous membrane, which is continuous with the lining membrane of the tubuli, and forms a cup-like pouch, the *calyx*, around each papilla.

The calices communicate with a common cavity of larger size, situated at each extremity and in the middle of the organ; and these three cavities—the *infundibula*—constitute by their union the large membranous sac, which occupies the hilus renalis, the *pelvis* of the kidney.

The kidney in the embryo and fœtus consists of lobules. [See the anatomy of the fœtus.]

The *ureter*, the excretory duct of the kidney, is a dilated tube of about the diameter of a goose-quill, and nearly eighteen inches in length; it is continuous superiorly with the pelvis of the kidney, and is constricted inferiorly, where it lies in an oblique direction between the muscular and mucous coats of the base of the bladder, and opens upon its mucous surface. Lying along the posterior wall of the abdomen, it crosses the psoas muscle, the common iliac artery, and the vas deferens.

The ureter, the pelvis, the infundabula, and the calices, are composed of two coats, an external or fibrous coat, the tunica propria, and an internal mucous coat which is continuous with the mucous membrane of the bladder inferiorly, and with the lining of the tubuli uriniferi above.

Vessels and *nerves*.—The renal artery is derived from the aorta; it divides into several large branches before entering the hilus.

The *veins* terminate in the vena cava by a single large trnnk, the left renal vein receiving the left spermatic vein. Injections thrown into the renal artery and returning by the vein generally make their way into those vessels by rupture; and when the injection returns by the tubuli uriniferi, it always occurs from the bursting of the capillary vessels of the ducts into their cavities. The *lymphatic vessels* terminate in the lumbar glands.

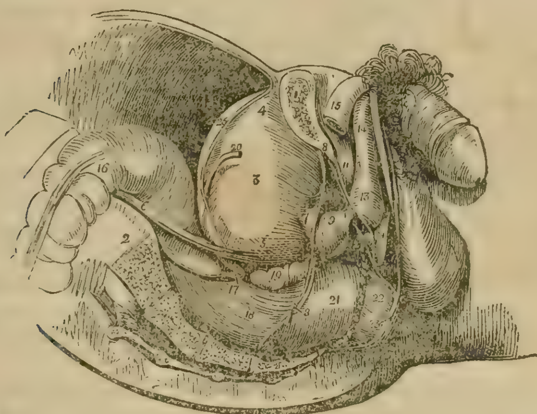
The *nerves* are derived from the renal plexus, which is formed partly by the solar plexus, and partly by the lesser splanchnic nerve. The renal plexus gives branches to the spermatic plexus, and branches which accompany the ureters: hence the morbid sympathies which exits between the kidney, the ureter, and the testicle; and by the communications with the solar plexus, with the stomach and diaphragm, and, indeed, with the whole system.

THE PELVIS.

The cavity of the pelvis is that portion of the great abdominal cavity which is included within the bones of the pelvis, below the level of the linea-ilio-pectinea and the promontory of the sacrum. It is bounded by the cavity of the abdomen above, and the perineum below; and its inter parietes are formed in front, below, and at the sides, by the peritoneum, pelvic fascia, levator ani muscles, obturator fasciæ, and muscles; and behind by the sacrum and sacral plexus of nerves.

The *viscera* of the pelvis in the male, are the urinary bladder, the prostrate gland, vesiculæ seminales, and the rectum.

PLATE 21.*



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* *A Side View of the Viscera of the Male Pelvis in situ.*—(The right side of the pelvis has been removed by a vertical section through the os pubis, near to the symphysis: and another through the middle of the sacrum.) 1. The divided surface of the os pubis. 2. The divided surface of the sacrum. 3. The body of the bladder. 4. Its fundus; from the apex is seen passing upwards the urachus. 5. The base of the bladder. 6. the ureter. 7. The neck of the bladder. 8, 8. The pelvic fascia; the fibres immediately above 7 are given off from the pelvic fascia, and represent the anterior ligaments of the bladder. 9. The prostrate gland. 10. The membranous portion of the urethra, between the two layers of the deep perineal fascia. 11. The deep perineal fascia, formed of two layers. 12. One of Cowper's glands, between the two layers of deep perineal fascia, and beneath the membranous portion of the uretha. 13. The bulb of the corpus spongiosum. 14. The body of the corpus spongiosum. 15. The right crus penis. 16. The upper part of the first portion of the rectum. 17. The recto-vesical fold of peritoneum. 18. The second portion of the rectum. 19. The right vesicula seminalis. 20. The vas deferens. 21. The rectum covered with the descending layer of the deep perineal fascia, just as it is making its bend backwards to constitute the third portion. 22. A part of the levator ani muscle investing the lower part of the rectum. 23. The external sphincter ani. 24. The interval between the deep and superficial perineal fascia; they are seen to be continuous beneath the figure.

BLADDER.

The *bladder* is an oblong membranous viscus, situated behind the pubis and in front of the rectum. It is larger in its vertical axis than from side to side; and is divided into body, fundus, base, and neck. The *body* comprehends the middle zone of the organ; the *fundus*, its upper segment; the *base*, the lower broad extremity, which rests upon the rectum; and the *neck*, the narrow constricted portion which is applied against the prostrate gland.

This organ is retained in its place by ligaments, which are divided into true and false; the true ligaments are seven in number, two anterior, two lateral, two umbilical, and the urachus; the false ligaments are folds of the peritoneum, and are four in number, two anterior and two posterior.

The *anterior* ligaments are formed by the pelvic fascia, which passes from the inner surface of the os pubis, on each side of the symphysis, to the front of the bladder.

The *lateral* ligaments are formed by the reflection of the pelvic fascia from the levatores ani muscles, upon the sides of the base of the bladder.

The *umbilical* ligaments are the fibrous cords which result from the obliteration of the umbilical arteries of the fœtus; they pass forwards on each side of the fundus of the bladder, and ascend beneath the peritoneum to the umbilicus.

The *urachus* is a small fibrous cord, formed by the obliteration of a tubular canal existing in the embryo; it is attached to the apex of the bladder, and thence ascends to the umbilicus.

The *false ligaments* are folds of peritoneum, the two lateral correspond with the passage of the vasa deferentia, from the sides of the bladder to the internal abdominal ring, and the two posterior with the course of the umbilical arteries, to the fundus of the organ.

The bladder is composed of three coats, an external or serous coat, a muscular, and a mucous coat. The *serous* coat is partial, and derived from the peritoneum, which invests the posterior surface and sides of the bladder, from about opposite the point of termination of the two ureters to its summit, where it is guided to the anterior wall of the abdomen by the umbilical ligaments and urachus.

The *muscular* coat consists of two layers, an external layer composed of longitudinal fibres, the detrusor urinæ, and an internal layer of oblique and transverse fibres irregularly distributed. The anterior longitudinal fibres commence by four tendons (the tendons of the bladder or of the detrusor urinæ), two superior from the os pubis, and two inferior from the ra-

mus of the ischium on each side, and spread out as they ascend the anterior surface of the bladder to its fundus; they then converge upon the posterior surface of the organ, and descend to its neck, where they are inserted into the isthmus of the prostrate gland, and into a ring of elastic tissue, which surrounds the commencement of the prostatic portion of the urethra. Some of the anterior fibres are also attached to this ring. The lateral fibres commence at the prostrate gland and the elastic ring of the urethra on one side, and spread out as they ascend upon the side of the bladder, to descend upon the opposite side, and be inserted into the prostrate and opposite segment of the same ring.

It has been shown, that there are no fibres at the neck of the bladder capable of forming a sphincter vesicæ. The fibres corresponding with the trigonum vesicæ are transverse.

Sir Astley Cooper has demonstrated around the neck of the bladder, within the prostrate gland, a ring of elastic tissue, which has for its object the mechanical closing of the urethra against the involuntary passage of the urine. It is into this elastic ring that the longitudinal fibres of the detrusor urinæ are inserted, so that this muscle taking a fixed point at the os pubis will not only compress the bladder, and thereby tend to force its contents along the urethra, but will at the same time, by means of its attachment to this ring, dilate the entrance of the urethra, and afford a free egress to the contents of the bladder.

The *mucous* coat is thin and smooth, and exactly moulded upon the muscular coat, to which it is connected by a somewhat thick layer of submucous tissue, called by some anatomists the nervous coat; its papillæ are very minute, and there is scarcely a trace of mucous follicles. This mucous membrane is continuous through the ureters with the lining membrane of the uriniferous ducts, and through the urethra, with that of the prostatic ducts, tubuli semenifery, and Cowper's glands.

Upon the internal surface of the base of the bladder is a triangular smooth plane, of a paler color than the rest of the mucous membrane; the trigonum vesicæ, or *trigone vesicale.* This is the most sensitive part of the bladder, and the pressure of calculi upon it gives rise to great suffering. It is bounded on each side by the raised ridge, corresponding with the muscles of the ureters; at each posterior angle by the openings of the ureters, and in front by a slight elevation of the mucous membrane at the entrance of the urethra, called the *uvula vesicæ.*

The external surface of the base of the bladder, corresponding with the trigonum, is also triangular, and is separated from the rectum merely by a thin layer of fibrous membrane, the

recto-vesical fascia. It is bounded behind by the recto-vesical fold of peritoneum, and on each side by the vas deferens and vesicula seminalis, which converge almost to a point at the base of the prostrate gland. It is through this space that the opening is made in the recto-vesical operation for puncture of the bladder.

PROSTRATE GLAND.

The *prostrate gland* is situated in front of the neck of the bladder, behind the deep perineal fascia, and upon the rectum, through which it may be distinctly felt. It surrounds the commencement of the urethra for a little more than an inch of its extent, and resembles a Spanish chesnut both in size and form, the base being directed backwards towards the neck of the bladder, the apex forwards, and the convex side towards the rectum. It is retained firmly in its position by the two superior and the two inferior tendons of the bladder, by the attachments of the pelvis fascia, and by a process of the internal layer of the deep perineal fascia, which forms a sheath around the membranous urethra, and is inserted into the apex of the gland. It consists of three lobes, two lateral and a middle lobe or isthmus; the lateral lobes are distinguished by an indentation upon its base, and by a slight furrow upon the upper and lower surface of the gland. The third lobe or isthmus is a small transverse band, which passes between the two lateral lobes at the base of the organ.

In structure, the prostrate gland is composed of ramified ducts, terminating in lobules of follicular pouches, which are so closely compressed as to give to a thin section of the gland a cellular appearance beneath the microscope. It is pale in texture and hard, splits easily in the course of its ducts, and is surrounded by a plexus of veins which are enclosed by the strong fibrous membrane with which it is invested. Its secretion is poured into the prostatic portion of the urethra by fifteen or twenty excretory ducts. The urethra in passing through the prostrate, lies one third nearer to its upper than its lower surface.

VESICULÆ SEMINALES.

Upon the under surface of the base of the bladder, and converging towards the base of the prostrate gland, are two lobulated and somewhat pyriform bodies, about two inches in length—the vesiculæ seminales. Their upper surface is in contact with the base of the bladder; the under side rests upon the rectum, separated only by the recto-vesical fascia; the larger extremities are directed backwards and outwards, and the smaller ends almost meet at the base of the prostrate. They enclose between them a triangular space, which is bounded

posteriorly by the recto-vesical fold of peritoneum, and which corresponds with the trigonum vesicæ on the interior of the bladder.

Each vesicula is formed by the convolutions of a single tube, which gives off several irregular cæcal branches. It is enclosed in a dense fibrous membrane, derived from the pelvic fascia, and is constricted beneath the isthmus of the prostrate gland into a small excretory duct. The vas deferens, somewhat enlarged and convoluted, lies along the inner border of each vesicula, and is included in its fibrous investment. It communicates with the duct of the vesicula, beneath the isthmus of the prostrate, and forms the ejaculatory duct.

The ejaculatory duct is about three quarters of an inch in length, and running forwards, first between the base of the prostrate and the isthmus, and then through the elastic tissue of the veru montanum, opens upon the mucous membrane of the urethra, near its fellow of the opposite side, at the anterior extremity of that process.

MALE ORGANS OF GENERATION.

The organs of generation in the male are, the penis and the testes, with their appendages.

The *penis* is divided into a body, root, and extremity. The *body* is surrounded by a thin integument, which is remarkable for the looseness of its cellular connection with the deeper parts of the organ, and for containing no adipose tissue. The *root* is broad, and firmly adherent to the rami of the pubis and ischium by two strong processes, the crura, and is connected to the symphysis pubis by a fibrous membrane, the ligamentum suspensorium.

The *extremity*, or *glans penis*, resembles an obtuse cone, somewhat compressed from above downwards, and of a deeper red color than the surrounding skin. At its apex is a small vertical slit, the meatus urinarius, which is bounded by two more or less protuberant labia; and, extending backwards from the meatus, is a depressed raphe, to which is attached a loose fold of mucous membrane, the frænum præputii. The base of the glans is marked by a projecting collar, the *corona glandis*, upon which are seen a number of small papillary elevations, formed by the aggregation of minute sebaceous glands—the glandulæ Tysoni. Behind the corona is a deep fossa, bounded by a circular fold of integument, the *præputium*, which, in the quiescent state of the organ, may be drawn over the glans, but in its distended state is obliterated, and serves to facilitate its enlargement. The internal surface of the prepuce is lined by mucous membrane, covered by a thin cuticle; this membrane, upon reaching the base of the glans, is reflected over the

glans penis, and, at the meatus urinarius, becomes continuous with the mucous lining of the urethra.

The penis is composed of the corpus cavernosum and corpus spongiosum, and contains in its interior the largest portion of the urethra.

The *corpus cavernosum* is distinguished into two lateral portions by an imperfect septum and by a superior and inferior groove, and is divided posteriorly into two crura. It is firmly adherent, by means of its crura, with the ramus of the pubis and ischium. It forms anteriorly a single rounded extremity, which is received into a fossa in the base of the glans penis; the superior groove lodges the dorsal vessels of the organ, and the inferior receives the corpus spongiosum. Its fibrous tunic is thick, elastic, and extremely firm, and sends a number of fibrous bands and cords (trabeculæ) inwards from its inferior groove, which cross its interior in a radiating direction, and are inserted into the inner walls of the tunic. These trabeculæ are most abundant on the middle line, where they are ranged vertically, side by side, somewhat like the teeth of a comb, and constitute the imperfect partition of the corpus cavernosum, the *septum pecteniforme*. This septum is more complete at its posterior than towards its anterior part.

The tunic of the corpus cavernosum consists of strong longitudinal fibrous fasciculi, closely interwoven with each other. Its internal structure is composed of erectile tissue.

The *corpus spongiosum* is situated along the under surface of the corpus cavernosum, in its inferior groove. It commences by its posterior extremity between and beneath the crura penis, where it forms a considerable enlargement, the *bulb*, and terminates anteriorly by another expansion, the *glans penis*. Its middle portion or body is nearly cylindrical, and tapers gradually from its posterior towards its anterior extremity. The bulb is adherent to the deep perineal fascia, by means of the tubular prolongation of the anterior layer, which surrounds the membranous portion of the urethra; in the rest of its extent the corpus spongiosum is attached to the corpus cavernosum by cellular tissue, and by veins which wind around that body to reach the dorsal vein. It is composed of erectile tissue, enclosed by a dense fibrous tissue, much thinner than that of the corpus cavernosum, and contains in its interior the spongy portion of the urethra, which lies nearer to its upper than its lower wall.

Erectile tissue is a peculiar cellulo-vascular structure, entering in considerable proportion into the composition of the organs of generation. It consists essentially of a plexus of veins so closely convoluted and interwoven with each other, as to give rise to a cellular appearance when examined upon the

surface of a section. The veins forming this plexus are smaller in the glans penis, corpus spongiosum, and circumference of the corpus cavernosum, than in the central part of the latter, where they are large and dilated. They have no other coat than the internal lining prolonged from the neighboring veins; and the interstices of the plexus are occupied by a peculiar reddish fibrous substance. They receive their blood from the capillaries of the arteries, in the same manner with veins generally.

Vessels and *nerves*.—The arteries of the penis are derived from the internal pudic; they are the arteries of the bulb, arteries of the corpus cavernosum, and dorsales penis. Its *veins* are superficial and deep. The deep veins run by the side of the deep arteries, and terminate in the internal pudic veins. The superficial veins emerge in considerable number from the base of the glans, and converge on the dorsum penis, to form a large dorsal vein, which receives other veins from the corpus cavernosum and spongiosum in its course, and passes backwards between two layers of the ligamentum suspensorium, and through the deep fascia beneath the arch of the pubis, to terminate in the prostatic and vesical plexus.

The *lymphatics* terminate in the inguinal glands. The *nerves* are derived from the internal pudic nerve, from the sacral plexus, and from the hypogastric plexus.

URETHRA.

The *urethra* is the membranous canal extending from the neck of the bladder to the meatus urinarius. It is sigmoid in its course, and is composed of two layers, a mucous coat and an elastic fibrous coat. The mucous coat is thin and smooth; it is continuous, internally, with the mucous membrane of the bladder; externally, with the investing membrane of the glans; and, in certain points of its extent, with the lining membrane of the numerous ducts of mucous glands—of those of Cowper's glands, the prostrate gland, vasa deferentia, and vesiculæ seminales. The elastic fibrous coat varies in thickness in the different parts of the course of the urethra: it is thick in the prostate gland, forms a firm investment for the membranous portion of the canal, and is thin in the spongy portion, where it serves as a bond of connection between the mucous membrane and the corpus spongiosum. The urethra is about nine inches in length, and is divided into a prostatic, membranous, and spongy portion.

The *prostatic portion*, a little more than an inch in length, is situated in the prostrate gland, about one-third nearer to its upper than its lower surface, and extending from its base to its apex. Upon its lower circumference or floor is a longitudinal

fold of mucous membrane—the *veru montanum*, or caput gallinaginis—and on each side of the veru a suppressed fossa—the *prostatic sinus*—in which are seen the numerous openings of the prostatic ducts. At the anterior extremity of the veru montanum are the openings of the two ejaculatory ducts, and between them a third opening, which leads backwards into a dilated sac—the sinus pocularis. The prostatic portion of the urethra, when distended, is the most dilated part of the canal; but, excepting during the passage of the urine, is completely closed by means of a ring of elastic tissue which encircles the urethra as far as the anterior extremity of the veru montanum. In the contracted state of the urethra, the veru montanum acts as a valve, being pressed upwards against the upper wall of the canal; but, during the action of the detrusor muscle of the bladder, the whole elastic ring is expanded by the muscular fibres which are inserted into it; and the veru is especially drawn downwards by two delicate tendons, which have been traced by Mr. Tyrrell, from the posterior fibres of the destrusor into the tissue of this process.

The discovery of this beautiful structure is due to Sir Astley Cooper, and is one other instance of the marvellous indications of design evinced in the structure of the animal frame. Instead of a muscular apparatus, liable to fatigue, Nature has employed, for the purpose of retaining the urine, an elastic substance, which closes the urethra constantly, by an unwearying physical property. Expulsion, on the contrary, occurring only at intervals, demands the exercise of muscular action, that action being immediately applied to the elastic agent and drawing it aside. It is by means of this interesting provision that the semen and the last drops of urine are expelled from the urethra without a chance of reflux into the bladder, and that the urine is enabled to pass freely along in its canal, without danger of entering the prostatic or ejaculatory ducts.

The *membranous portion*, the narrowest part of the canal, is somewhat less than an inch in length. It is situated between the two layers of the deep perineal fascia, and is surrounded by the fan like expansions of the upper and lower segments of the compressor urethæ muscle, which meet at the *raphe* along its upper and lower surface. It is continuous posteriorly with the prostratic urethra, and anteriorly with the spongy portion of the canal. Its coverings are the mucous membrane, elastic fibrous layer, compressor urethræ muscle, and a partial sheath from the deep perineal fascia.

The *spongy portion* forms the rest of the extent of the canal, and is lodged in the corpus spongiosum from its commencement at the deep perineal fascia to the meatus urinarius.

It is narrowest in the body, and becomes dilated at either extremity, posteriorly in the bulb, where it is named the bulbous portion, and anteriorly in the glans penis, where it forms the fossa navicularis. The meatus urinarius is the most constricted part of the canal; so that a catheter which will enter that opening may be passed freely through the whole extent of a healthy urethra. Opening into the bulbous portion, are two small excretory ducts, about three quarters of an inch in length, which may be traced backwards between the coats of the urethra and the bulb to the interval between the two layers of the deep perineal fascia, where they ramify in two small lobulated and somewhat compressed glands of about the size of peas. These are Cowper's glands; they are situated immediately beneath the membranous portion of the urethra, and are enclosed by the lower segment of the compressor urethræ muscle, so as to be subject to muscular compression.

Upon the whole of the internal surface of the spongy portion of the urethra, particularly along its upper wall, are numerous small openings, or lacunæ, which are the entrances of mucous glands situated in the submucous cellular tissue. The openings of these lacunæ are directed forwards, and are liable occasionally to intercept the point of a small catheter in its passage to the bladder. At about an inch and an half from the opening of the meatus, one of these lacunæ is generally found much larger than the rest, and is named the *lacuna magna.*

TESTES.

The *testes* are two small glandular organs, suspended from the abdomen by the spermatic cords, and enclosed in an external tegumentary covering, the scrotum.

The *scrotum* is distinghished into two lateral halves by a *raphe*, which is continued anterierly along the under surface of the penis, and posteriorly along the middle of the perineum to the anus. Of these two lateral portions the left is somewhat longer than the right, and corresponds with the greater length of the spermatic cord on the left side.

The scrotum is composed of two layers, the integument and a proper covering, the dartos; the integument is extremely thin, transparent and abundant, and beset by a number of hairs, which issue obliquely from the skin and have prominent roots. The dartos is a thin layer of a peculiar contractile fibrous tissue, intermediate in properties between muscular fibre and elastic tissue; it forms the proper tunic of the scrotum, and sends inwards a distinct septum, which divides it into two cavities for the two testes. The dartos is continuous around the base of the scrotum with the common superficial fascia of the abdomen and perineum.

The *spermatic cord* is the medium of communication between the testes and the interior of the abdomen; it is composed of arteries, veins, lymphatics, nerves, the excretory duct of the testicle and its proper coverings. It commences at the internal abdominal ring, where the vessels of which it is composed converge, and passes obliquely along the spermatic canal; the cord then escapes at the external abdominal ring, and descends through the scrotum to the posterior border of the testicle. The left cord is somewhat longer than the right, and permits of the greater depth of the left testicle.

The *arteries* of the spermatic cord are, the spermatic artery from the aorta, the deferential artery, accompanying the vas deferens from the superior vesical, and the cremasteric branch, from the epigastric artery.

The *spermatic veins* form a plexus which constitutes the chief bulk of the cord; they are provided with valves at short intervals, and the smaller veins have a peculiar tendril-like arrangement, which has obtained for them the name of vassa pampiniformia.

The *lymphatics* are of large size, and terminate in the lumbar glands.

The *nerves* are the spermatic plexus, which is derived from the aortic and renal plexus, and genital branch of the genito-crural nerve, and the scrotal branch of the ilio-scrotal.

The *vas deferens*, the excretory duct of the testicle, is situated along the posterior border of the cord, where it may easily be distinguished by the hard and cordy sensation which it communicates to the fingers. Its parietes are very thick and tough, and its canal extremely small, and lined by the mucous membrane continued from the urethra.

The *coverings of the spermatic cord* are the spermatic fascia, cremaster muscle, and fascia propria.

The *spermatic fascia* is a prolongation of the intercolumnar fascia derived from the borders of the external abdominal ring during the descent of the testicle in the fœtus.

The *cremasteric covering* (erythroid) is the thin muscular expansion formed by the spreading out of the fibres of the cremaster, which is likewise carried down by the testis during its descent.

The *fascia propria* is a continuation of the infundibiliform process from the transversalis fascia which immediately invests the vessels of the cord, and is also obtained during the descent of the testis.

The *testis* (testicle) is a small oblong and rounded gland, somewhat compressed upon the sides and behind, and suspended in the cavity of the scrotum by the spermatic cord.

Its position in the scrotum is oblique, so that the upper extre-

mity is directed upwards and forwards, and a little outwards; the lower downwards and backwards, and a little inwards; the convex surface looks forwards and downwards, and the flattened surface, to which the cord is attached, backwards and upwards. Lying against its outer and posterior border, is a flattened body, which follows the course of the testicle and extends from its upper to its lower extremity; this body is named, from its relation to the testis, *epididymis;* it is divided into a central part or body, an upper extremity, or globus major, and a lower extremity, globus minor epididymis. The globus major is situated upon the upper end of the testicle, to which it is closely adherent; the globus minor is placed at its lower end, is attached to the testis by cellular tissue, and curves upwards, to become continuous with the vas deferens.

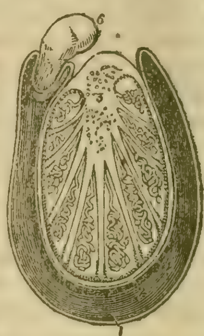
The testis is invested by three tunics—tunica vaginalis, tunica albuginea, and tunica vasculosa; and is connected to the inner surface of the dartos by a large quantity of extremely loose cellular tissue, in which fat is never deposited, but which is very susceptible of serous infiltration.

The *tunica vaginalis* is a pouch of serous membrane derived from the peritoneum in the descent of the testis, and afterwards obliterated from the abdomen to within a short distance of the gland. Like other serous coverings, it is a shut sac, investing the organ, and thence reflected, so as to form a bag around its circumference; hence it is divided into the tunica vaginalis propria, and tunica vaginalis reflexa. The tunica vaginalis propria covers the surface of the tunica albuginea, and surrounds the epididymis, connecting it to the testis by means of a distinct duplicature. The tunica vaginalis reflexa is attached by its external surface, through the medium of a quantity of loose cellular tissue, to the inner surface of the dartos. Between the two layers is the smooth surface of the shut sac, moistened by its proper secretion.

The *tunica albuginea* is a thick fibrous membrane, of a bluish white color, and the proper tunic of the testicle. It is adherent externally to the tunica vaginalis propria, and from the union of the serous with a fibrous membrane, is considered a fibro-serous membrane, like the dura mater and pericardium. After surrounding the testicle, the tunica albuginia is reflected from its posterior border into the interior of the gland, and forms a projecting longitudinal ridge, which is called the *mediastinum testis*, from which numerous fibrous cords are given off, to be inserted into the inner surface of the tunic. The mediastinum serves to contain the vessels and ducts of the testicle in their passage into the substance of the organ, and the fibrous cords are admirably fitted to prevent compression of the gland.

If a transverse section be made of the testis, and the surface of the mediastinum examined, it will be observed that the blood vessels of the substance of the organ are situated near the posterior border of the mediastinum, while the divided ducts occupy a place nearer to the free margin.

PLATE 22.*



The *tunica vasculosa* is the nutrient membrane of the testis; it is situated immediately within the tunica albuginia, and encloses the substance of the gland, sending processes inwards between the lobules, in the same manner that the pia mater is reflected between the convolutions of the brain.

The substance of the testis consists of numerous conical flattened lobules, the bases being directed towards the surface of the organ, and the apices towards the mediastinum. The lobules are composed of a multitude of minute convoluted tubes, having the same diameter throughout; these are the *tubuli seminiferi;* they are of a bright yellow color, and terminate at the apices of the lobules in small straight ducts of somewhat larger size, the *vasa recta;* the vasa recta, entering the mediastinum, form a vertical plexus of ducts, the *rete testis*, which proceeds from below upwards, and terminates at the upper extremity of the organ, in eight or ten larger ducts, which quit the testicle under the name of *vasa efferentia.* The vasa efferentia, having emerged from the posterior part of the upper end of the organ, form a series of conical convolutions, which are called *coni vasculosi;* from the bases of these cones tubes of larger size proceed, which constitute by their complex convolutions the body of the epididymis. The tubes become gradually larger towards the lower end of the epididymis, and terminate in a single large and convoluted duct, the vas deferens.

The *epididymis* is formed by the convolutions of the excretory seminal ducts, externally to the testis, previously to their termination in the vas deferens. The more numerous convolutions and the aggregation of the coni vasculosi at the upper end of the organ, form the globus major; the continuation of

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* *Transverse Section of the Testicle.*—1. The cavity of the tunica vaginalis; the most external layer is the tunica vaginalis reflexa; and that in contact with the organ, the tunica vaginalis propria. 2. The tunica albuginea. 3. The mediastinum testis, giving off numerous fibrous cords in a radiated direction to the internal surface of the tunica albuginea. The cut extremities of the vessels in front of the number belong to the rete testis, and those behind to the arteries and veins of the organ. 4. The tunica vasculosa, or pia mater testis. 5, 5. The lobules, consisting of the convolutions of the tubuli seminiferi, and terminating by single ducts the vasa recta. 6. Section of the epididymis

the convolutions downwards is the body, and the smaller number of convolutions of the single tube at the lower extremity, the globus minor. The tubuli are connected together by a very delicate cellular tissue, and are enclosed by the tunica vaginalis.

A small convoluted duct, of variable length, is generally connected with the duct of the epididymis immediately before the commencement of the vas deferens. This is the vasculum aberrans of Haller; it is attached to the epididymis by the cellular tissue in which that body is enveloped. Sometimes it becomes dilated towards its extremity, but more frequently retains the same diameter throughout.

The *vas deferens* may be traced upwards in the course of the seminal fluid from the globus minor of the epididymis along the posterior part of the spermatic cord to the internal abdominal ring. From the ring it is reflected inwards, to the side of the fundus of the bladder, and descends along its posterior surface, crossing the direction of the ureter, to the inner border of the vesicula seminalis. In this situation it becomes somewhat larger in size and convoluted, and terminates at the base of the prostrate gland, by uniting with the duct of the vesicula seminalis, and constituting the ejaculatory duct. The ejaculatory duct, which is thus formed by the junction of the duct of the vesicula seminalis with the vas deferens, passes forwards to the anterior extremity of the veru montanum, where it terminates by opening into the prostatic urethra.

FEMALE PELVIS.

The peculiarities in the form of the female pelvis have already been examined with the anatomy of the bones. Its lining boundaries are the same with those of the male. The contents, are, the bladder, vagina, uterus with its appendages, and the rectum. Some portion of the small intestines also occupy the upper part of its cavity.

The *bladder* is in relation with the pubis in front, and with the vagina beneath. Its form corresponds with that of the pelvis, being broad from side to side, and often bulging more on one side than on the other. This is particularly evident after frequent parturition. The *coats* of the bladder are the same as those of the male.

The *urethra* is about an inch and a half in length, and is lodged in the upper wall of the vagina, in its course forwards, beneath the arch of the pubis, to the meatus urinarius. It is lined by mucous membrane, which is continuous internally with that of the bladder, and externally with the vulva, and is surrounded by a proper coat of elastic tissue, to which the muscular fibres of the detrusor urinæ are attached. It is to this tis-

sue that is due the remarkable dilatability of the female urethra, and its speedy return to its original diameter. The meatus is encircled by a ring of fibrous tissue, which prevents it from distending with the same facility as the rest of the canal, hence it becomes necessary in performing this operation to divide its margin slightly with a knife.

Vagina.—The *vagina* is a membranous canal, leading from the vulva to the uterus, and corresponding in direction with the axis of the outlet of the pelvis. It is constricted at its commencement, but near the uterus becomes considerably dilated. Its length is very variably: but it is always longer upon the posterior than upon the anterior wall, the former being usually five or six inches in length, and the latter four or five. It is inserted into the cervic of the uterus, which projects into the upper extremity of the canal.

In *structure* the vagina is composed of a *mucous lining*, a layer of *erectile tissue*, and an external tunic of a *fibrous* structure, resembling the dartos of the scrotum. The upper half of the posterior wall of the vagina is covered, on its pelvic surface, by the peritoneum; and in front, the peritoneum is reflectted from its upper part to the posterior surface of the bladder.

The *mucous membrane* presents a number of *transverse papillæ* or *rugæ* upon its upper and lower surfaces, which extend outwards on each side from a middle *raphe.* The transverse papillæ and *raphe* are more apparent upon the upper than upon the lower surface, and the two raphe are called the *columns of the vagina.* The mucous membrane is covered by a thin cuticular epithelium, which is continued from the labia, and terminates by a fringed border at the inner margin of the os uteri.

The *external*, or *dartoid layer* of the vagina, serves to connect it to the surrounding viscera. Thus, it is very closely adherent to the under surface of the bladder, and drags that organ down with it in prolapsus uteri. To the rectum it is less closely connected, and that intestine is therefore less frequently affected in prolapsus.

UTERUS.

The *uterus* is a flattened organ of a pyriform shape, having the base directed upwards and forwards, and the apex downwards and backwards in the line of the axis of the inlet of the pelvis, and forming a considerable angle with the course of the vagina. In the unimpregnated state it is about three inches in length, two in breadth across the broadest part, and one in thickness, and is divided into fundus, body, cervix, and os uteri.

The *fundus* and *body* are enclosed in a duplicature of peri-

toneum, which is connected with the two sides of the pelvis, and forms a transverse septem between the bladder and rectum. The folds formed by this duplicature of peritoneum on either side of the organ are the *broad ligaments* of the uterus. The *cervix* is the lower portion of the organ which is distinguished from the body by a well-marked constriction; to its upper part is attached the upper extremity of the vagina, and at its extremity is a transverse opening—the *os uteri*—bounded before and behind by two labia, the posterior labium being the larger and more projecting. The transverse opening of the os uteri is of considerable size, and is named the orificium uteri externum; the canal then becomes narrowed, and at the upper end of the cervix is constricted into a smaller opening—the orificium internum. At this point the canal of the cervix expands into the shallow triangular cavity of the uterus, the inferior angle corresponding with the orificium internum, and the two superior angels with the commencement of the Fallopian tubes. In the canal of the cervix uteri are two or three longitudinal folds to which numerous oblique folds converge so as to give the idea of branches from the stem of a tree; hence this appearance has been denominated the *arbor vitæ uterina.* Between these folds, and around the os uteri, are occasionally seen some enlarged mucous follicles which have been named the *ocula of Naboth.*

Structure.—The uterus has three coats, an internal or *mucous*, a *fibrous* or muscular, and a *peritoneal coat.* In the unimpregnated state the fibrous structure is dense and pale, and very indistinct; but in the impregnated uterus it is decidedly muscular, and may be clearly demonstrated. The fibres are then observed to be disposed in three layers, an *external* consisting of *longitudinal fibres*; a *middle*, of *oblique fibres*, some of which pass off upon the Fallopian tubes, and others upon the round ligaments; and a *third layer* consists of *concentric circles of fibres*, having their centre at the commencement of the Fallopian tubes. In the cervix uteri the fibres are circular.

Vessels and Nerves.—The *arteries* of the uterus are the uterine from the internal iliac, and the spermatic from the aorta. The *veins* are very large and remarkable; in the impregnated uterus they are called sinuses, and consist of canals channelled through the substance of the organ, being merely lined by the internal membrane of the veins. The *lymphatics* terminate in the lumbar glands.

The *nerves* are derived from the hypogastric and spermatic plexuses, and from the sacral plexus.

The *appendages of the uterus* are enclosed by the lateral duplicatures of peritoneum, called the broad ligaments. They are the *Fallopian tubes* and *ovaries.*

FALLOPIAN TUBES.

The *Fallopian tubes* are two tubular prolongations which pass off, one on each side, from the upper angles of the uterus. At their commencement they are small, but they gradually increase as they pass outwards, and terminate by expanded *fimbriated extremities.* One of these fringes, longer than the rest, is attached to the ovary, and serves to guide the tube in its seizure of that organ.

The tube is lined by mucous membrane, which is arranged in tortuous longitudinal folds; it is continuous internally with that of the uterus, and externally at the fimbriated extremity with the peritoneum. This is the only instance, in man, of a natural opening existing in a serous membrane. The external covering is derived from the peritoneum, and the middle coat is composed of a very vascular cellulo-fibrous tissue into which some few muscular fibres have been traced from the uterus.

OVARIES.

The *ovaries* are two oblong flattened bodies of a whitish color, situated in the posterior folds of the broad ligaments. They are connected to the upper angles of the uterus at each side by a rounded cord, the *ligaments of the ovary.*

The *structure* of the ovary is a spongy vascular tissue, containing *serous vesicles,* and enclosed in a dense fibrous tunic, covered by peritoneum. These vesicles are simple cysts containing a transparent albuminous fluid, of various size, and from ten to fifteen in number in each ovary. They are the ova in which the future embryo is developed. Bauer states, that the vesicles which are nearest the surface have a minute floating body in their interior, which is the rudiment of the germ.

After conception, a yellow spot is often found in one or both ovaries, and has been named the *corpus luteum.* It is formed of yellow, condensed substance, deposited in the place of the ovum, which has escaped. This was formerly considered a certain evidence of conception having taken place; but nothing can be more fallacious. It is often absent in women who have borne children, and it has been found in virgins, and even in a child five years of age.

Vessels and Nerves.—The *arteries* of the ovaries are the spermatic. Its *nerves* are derived from the spermatic plexus.

The *round ligaments* are two cellulo-fibrous cords situated between the layers of the broad ligaments, and extending from the upper angles of the uterus, and along the spermatic canals to the labia majora, in which they are lost. They are accompanied by a small artery and by several filaments of the spermatic plexus of nerves, and serve to retain the uterus in con-

nection with the anterior walls of the abdomen during its increase in bulk.

EXTERNAL ORGANS OF GENERATION.

The female organs of generation are divided into the internal and external; the internal are contained within the pelvis, and have been already described—they are the vagina, uterus, ovaries, and Fallopian tubes. The external organs are the mons veneris, labia majora, labia minora, clitoris, meatus urinarius, and the opening of the vagina.

The *mons veneris* is the eminence of integument, situated upon the front of the pubis. Its cellular tissue is loaded with adipose substance, and the surface covered with hairs.

The *labia majora* are two large longitudinal folds of integument, consisting of fat and loose cellular tissue. They enclose an elliptic opening called the *vulva*, which is bounded anteriorly by the commissura superior, and posteriorly by the commissura inferior. Stretching across the posterior commissure is a small transverse fold, the *frænulum labiorum* or fourchette, which is ruptured during parturition, and immediately within this fold is a small cavity, the *fossa navicularis*. The breadth of the perineum is measured from the posterior commissure to the margin of the anus, and is usually not more than an inch across. The external surface of the labia is covered with hairs; the inner surface is smooth, and lined by mucous membrane, which contains a number of sebaceous follicles, and is covered by a thin cuticular epithelium. The use of the labia majora is to favor the extension of the vulva during parturition; for, in the passage of the head of the fœtus, the labia are completely unfolded and effaced.

The *labia minora*, or *nymphæ*, are two smaller folds situated within the labia majora. Superiorly they are divided into two processes, which surround the glans clitoridis, the superior fold forming the præputium clitoridis, and the inferior its frænulum. Inferiorly, they diminish gradually in size, and are lost on the sides of the opening of the vagina. The nymphæ consist of mucous membrane, covered by a thin cuticular epithelium. They are provided with a number of sebaceous follicles, and contain, in their interior, a layer of erectile tissue.

The *clitoris* is a small elongated organ situated in front of the pubis, and supported by a suspensory ligament. It is formed by a small body, which is analogous to the corpus cavernosum of the penis, and, like it, arises from the ramus of the pubis and ischium on each side, by two *crura*. The extremity of the clitoris is called its *glans*. It is composed of erectile tissue, enclosed in a dense layer of fibrous membrane, and is suscepti-

ble of erection. Like the penis, it is provided with two small muscles, the *erectores clitoridis.*

At about an inch beneath the clitoris is *the entrance of the vagina*, an elliptic opening, marked by a projecting margin. The entrance to the vagina is closed in the virgin by a membrane of a semilunar form, which is stretched across the opening; this is the *hymen.* Sometimes the membrane forms a complete septum, and gives rise to great inconvenience by preventing the escape of the menstrual effusion. It is then called an *imperforate hymen.* The *hymen* must not be considered a necessary accompaniment to virginity, for its existence is very uncertain. When present it assumes a variety of appearances: it may be a membranous fringe, with a round opening in the centre, or it is a semilunar fold, leaving an opening in front; or a transverse septum, having an opening both in front and behind.

The rupture of the hymen or its rudimentary existence, gives rise to the appearance of granulation around the opening of the vagina; these are called *caruncula myrtiformes.*

The triangular smooth surface beneath the clitoris and the entrance of the vagina, which is bounded on each side by the upper portions by the nymphæ, is the *vestibule.*

At the upper angle of the vagina is an elevation formed by the projection of the upper wall of the canal; and immediately in front of this tubercle, and surrounded by it, is the opening of the urethra, the *meatus urinarius.*

MAMMARY GLANDS.

The *mammæ* are situated in the pectoral region, and are separated from the pectoralis major muscle by a thin layer of superficial fascia. They exist in the male as well as in the female, but in a rudimentary state, unless excited into growth by some peculiar action, such as the loss or atrophy of the testes.

Their base is somewhat elliptical, the long diameter corresponding with the direction of the fibres of the pectoralis major muscle. The left mamma is generally a little larger than the right.

Near the centre of the convexity of each mamma is a small projection of the integument, called the *nipple*, which is surrounded by an *areola* having a colored tint. In the female before impregnation the color is a delicate pink; after impregnation it assumes a brownish hue, which deepens in color as pregnancy advances; and after the birth of a child, the brownish tint continues through life.

The areola is furnished with a considerable number of *sebaceous follicles*, which secrete a peculiar substance for the protection of the delicate cuticle around the nipple against the

friction of dress. During suckling these follicles are very much increased in size, and have the appearance of small pimples, projecting from the skin. At this period they serve by their increased secretion to defend the nipple and areola from the excoriating action of the saliva of the infant.

In *structure*, the mamma is a conglomerate gland, and consists of lobes, which are held together by a dense and firm cellular tissue; the lobes are composed of lobules, and the lobules of minute cæcal vesicles, the ultimate termination of the excretory ducts.

The excretory ducts, from ten to fifteen in number, commence by small openings at the apex of the nipple, and pass inwards, parallel with each other, towards the central part of the gland, where they form dilations and give off numerous branches to ramify through the gland to their ultimate terminations in the minute lobules.

The ducts and cæcal vesicles are lined throughout by a mucous membrane, which is continuous at the apex of the nipple with the integument.

In the nipple the excretory ducts are surrounded by a tissue analogous to the dartos of the scrotum, to which they owe their power of erectility. There is no appearance of any structure resembling erectile tissue.

Vessels and *nerves.*—The mammæ are supplied with *arteries* from the thoracic branches of the axillary, from the intercostals, and from the internal mammary.

The *lymphatics* follow the border of the pectoralis major to the axillary glands.

The *nerves* are derived from the thoracic and intercostals.

ANATOMY OF THE FŒTUS.

The medium weight of a child at the full period, at birth, is seven pounds, and its length nineteen inches. The head is of large size, and lengthened from before backwards—the face small. The upper extremities are greatly developed, and the thorax expanded and full. The upper part of the abdomen is large, from the great size of the liver; the lower part is small and conical. And the lower extremities are very small in proportion to the rest of the body. The external genital organs are very large, and fully developed.

Osseous system.—The developement of the osseous system has been treated of. The ligamentous system presents no peculiarity deserving of remark.

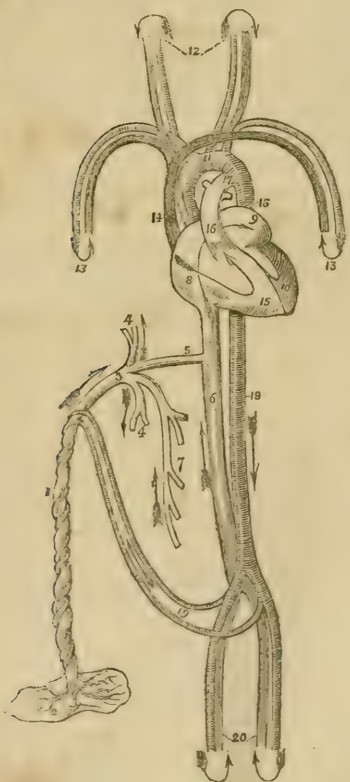
Muscular system.—The muscles of the fœtus at birth are large and fully formed. They are of a lighter color than those of the adult, and of a softer texture. The transverse striæ up-

on the fibres of animal life are not distinguishable until the sixth month of fœtal life.

Vascular system.—The circulating system presents several peculiarities: 1st, in the heart; there is a communication between the two auricles by means of the *foramen ovale.* 2dly, In the arterial system; there is a communication between the pulmonary artery and descending aorta, by means of a large trunk—the *ductus arteriosus.* 3dly, Also in the arterial system; the internal iliac arteries, under the name of hypogastric and *umbilical*, are continued from the fœtus to the placenta, to which they return the blood which has circulated in the system of the fœtus. 4thly, In the venous system; there is a communication between the umbilical vein and the inferior vena cava, called the *ductus venosus.*

FŒTAL CIRCULATION.

PLATE 23.*



* *The Fœtal Circulation.*—1. The umbilical cord, consisting of the umbilical vein and two umbilical arteries, proceeding from the placenta (2). 3.

The pure blood is brought from the placenta by the *umbilical vein.* The umbilical vein passes through the umbilicus, and enters the liver, where it divides into several branches, which may be arranged under three heads:—1st, two or three which are distributed to the left lobe. 2dly. A single branch which communicates with the portal vein in the transverse fissure, and supplies the right lobe. 3dly. A large branch, the *ductus venosus,* which passes directly backwards and joins the inferior cava.

In the inferior cava the pure blood becomes mixed with that which is returning from the lower extremities, and is carried through the right auricle, guided by the Eustachian valve, and through the *foramen ovale* into the left auricle. From the left auricle it passes into the left ventricle, and from the left ventricle into the aorta, whence it is distributed, by means of the carotid and subclavian arteries, principally to the head and upper extremities. From the head and upper extremities the impure blood is returned by the superior vena cava to the right auricle; from the right auricle it is propelled into the right ventricle; and from the right ventricle into the pulmonary artery.

In the adult, the blood would now be circulated through the lungs and decarbonized; but in the fœtus the lungs are solid, and almost impervious. Only a small quantity of the blood passes therefore into the lungs; the greater part rushes through the *ductus arteriosus,* into the commencement of the descending aorta.

Passing along the aorta, a small quantity of the impure blood is distributed by the external iliac arteries to the lower extremities; the greater portion enters the internal iliacs, and is carried onwards by the side of the bladder, and upwards along the anterior wall of the abdomen, and through the umbilicus, un-

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The umbilical vein dividing into three branches, two (4, 4,) to be distributed to the liver, and one (5), the ductus venosus, which enters the inferior vena cava (6). 7. The portal vein, returning the blood from the intestines, and uniting with the right hepatic branch. 8. The right auricle; the course of the blood is denoted by the arrow, proceeding from 8 to 9, the left auricle. 10. The left ventricle; the blood following the arrow to the arch of the aorta (11), to be distributed through the branches given off by the arch to the head and upper extremities. The arrows 12 and 13 represent the return of the blood from the head and upper extremities through the jugular and subclavian veins, to the superior vena cava (14), to the right auricle (8), and in the course of the arrow through the right ventricle (15), to the pulmonary artery (16). 17. The ductus arteriosus, which appears to be a proper continuation of the pulmonary artery; the offsets at each side are the right and left pulmonary artery cut off; these are of extremely small size as compared with the ductus arteriosus. The ductus arteriosus joins the descending aorta (18, 18), which divides into the common iliacs, and these into the internal iliacs, which become the umbilical arteries (19), and return the blood along the umbilical cord to the placenta; while the other divisions, the external iliacs (20), are continued into the lower extremities. The arrows at the termination of these vessels mark the return of the venous blood by the veins to the inferior cava.

der the name of *umbilical arteries*, to the placenta, to which they return the blood that has been circulated through the system of the fœtus.

From a careful consideration of this circulation we shall perceive—

1st. That the pure blood from the placenta is distributed in considerable quantity to the liver, before entering the general circulation. Hence arises the abundant nutrition of that organ, and its enormous size, in comparison with the other viscera.

2dly. That the right auricle is the scene of meeting of a double current; the one coming from the inferior cava, the other from the superior, and that they must cross each other in their respective course. How this crossing is effected the theorist will wonder; not so the practical anatomist; for a cursory examination of the fœtal heart will show, 1. That the direction of entrance of the two vessels is so opposite, that they may discharge their currents through the same cavity without admixture. 2. That the inferior cava opens almost directly into the left auricle. 3. That by the aid of the Eustachian valve, the current in the inferior cava will be almost entirely excluded from the right ventricle.

3dly. That the blood which circulates through the arch of the aorta comes directly from the placenta; and although mixed with the impure blood of the inferior cava, yet is propelled in so great abundance to the head and upper extremities, as to provide for the increased nutrition of these important parts, and prepare them, by their greater size and developement, for the functions which they are required to perform at birth.

4thly. That the blood circulating in the descending aorta is very impure, being obtained principally from the returning current in the superior cava, a small quantity only being derived from the left ventricle. Yet it is from this impure blood that the nutrition of the lower extremities is provided. Hence we are not surprised at their insignificant developement at birth; while we admire the providence of nature, that directs the nutrient current in abundance to the organs of sense, of prehension and of deglutition, so necessary even at the instant of birth to the safety and welfare of the creature.

After birth, the *foramen ovale* becomes gradually closed by a membranous layer, which is developed from the margins of the opening from below upwards, and completely separates the two auricles. The situation of the foramen is seen in the adult heart, upon the septum auricularum, and is called the *fossa ovalis*; the projecting margin of the opening forms the *annulus ovalis*.

As soon as the lungs have become inflated, by the first spas-

modic act of inspiration, the blood of the pulmonary artery rushes through its right and left branches into the lungs, to be returned to the left auricle by the pulmonary veins. Thus the pulmonary circulation is established, then the *ductus arteriosus* contracts, and degenerates into an impervious fibrous cord, serving in after life merely as a bond of union between the left pulmonary artery and the concavity of the arch of the aorta.

The current through the umbilical cord being arrested, the *umbilical arteries* likewise contract and become impervious, and degenerate into the *umbilical ligaments* of the bladder.

The *umbilical vein* and *ductus venosus*, also deprived of their circulating current, become reduced to fibrons cords, the former forming the *round ligauent* of the liver, and the latter a fibrous band, which may be traced along the fissure for the ductus venosus to the inferior vena cava.

Nervous system.—The brain is very soft, almost pulpy, and has a reddish tint throughout; the difference between the white and grey substance is not well marked. The nerves are firm, and well developed.

ORGANS OF SENSE.

Eye.—The eyeballs are of a large size and well developed at birth. The pupil is closed by a vascular membrane called the *membrana pupillaris*, which disappears at about the seventh month. Sometimes it remains permanently, and produces blindness. It consists of two thin membranous layers, between which the ciliary arteries are prolonged from the edge of the iris, and form arches by returning to it again, without anastomosing with those of the opposite side.

The removal of the membrane takes place by the contraction of their loops towards the edge of the pupil. The capsule of the lens is extremely vascular.

Ear.—The ear is remarkable for its early developement; the labyrinth and ossicula auditus are ossified at an early period, and the latter are completely formed before birth. The only parts remaining incomplete are the mastoid cells, and the meatus auditorius. The membrana tympani in the fœtal head is very oblique, occupying almost the basilar surface of the skull; hence probably arises a deficient acuteness in the perception of sound. It is also extremely vascular.

Nose.—The sense of smell is very imperfect in the infant, as may be inferred from the small capacity of the nasal fossæ, and the non-developement of the ethmoid, sphenoid, frontal, and maxillary sinuses.

The *thyroid gland* is of large size in the fœtus, and is deve-

loped by two lateral halves, which approach and become connected at the middle line, so as to form a single gland. It is doubtful whether it performs any especial function in fœtal life.

THYMUS GLAND.

The *thymus gland* consists of a thoracic and a cervical portion on each side. The former is situated in the anterior mediastinum, and the latter is placed in the neck, just above the first bone of the sternum, and behind the sterno-hyoidei and sterno-thyroidei muscles. It extends upwards from the fourth rib as high as the thyroid gland, resting upon the pericardium, and separated from the arch of the aorta and great vessels by the thoracic fascia in the chest, and lying on each side of the trachea in the neck.

Although described usually as a sinple gland, it consists actually of two lateral, almost symmetrical glands, connected with each other by cellular tissue only, and having no structural communication; they may therefore be properly called a right and a left thymus gland.

Between the second and third months of embryo existence, the thymus is so small as to be only just perceptible, and continues gradually increasing with the growth of the fœtus until the seventh. At the eighth month it is large; but during the ninth it undergoes a sudden change, assumes a greatly increased size, and at birth weighs 240 grains. After birth, it continues to enlarge until the expiration of the first year, when it ceases to grow, and gradually diminishes, until at puberty it has almost disappeared.

The thymus is a conglomerate gland, being composed of lobules disposed in a spiral form around a central cavity. The lobules are held together by a firm cellular tissue (reticulated), and the entire gland is enclosed in a coarse cellular capsule.

The *lobules* are very numerous, and vary in size from that of the head of a pin to a moderate sized pea. Each lobule contains in its interior a small cavity or *secretory cell*, and several of these cells open into a small *pouch* which is situated at their base, and leads to the central cavity, the *reservoir of the thymus*.

The *reservoir* is lined in its interior by a vascular mucous membrane, which is raised into ridges by a layer of ligamentous bands situated beneath it. The ligamentous bands proceed in various directions, and encircle the open mouths (pores) of the secretory cells and pouches. This ligamentous layer serves to keep the lobules together, and prevent the injurious distention of the cavity.

When either gland is carefully unravelled, by removing the cellular capsule and vessels and dissecting away the reticulated cellular tissue which retains the lobules in contact, the reservoir, from being folded in a serpentine manner upon itself, admits of being drawn out into a lengthened tubular cord, around which the lobules are clustered in spiral manner, and resemble knots upon a cord, or a string of beads.

The reservoir, pouches, and cells, contain a white fluid like chyle, or like cream, but with a small admixture of red globules.

PLATE 24.*

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* *A Section of the Thymus Gland* at the eighth month, showing its anatomy.—This figure, and the succeeding, were drawn from two of Sir Astley Cooper's beautiful preparations. 1. The cervical portions of the gland; the independence of the two lateral glands is well marked. 2. Secretory cells, seen upon the cut surface of the section; these are observed in all parts of the section. 3, 3. The pores or openings of the secretory cells or pouches; they are seen covering the whole internal surface of the great central cavity or reservoir. The continuity of the reservoir in the lower or thoracic portion of the gland with the cervical portion, is seen in the figure.

In an examination of the thymic fluid, made with a microscope magnifying 500 times linear measure, it was observed, that the corpuscules were very numerous, smaller than the blood corpuscules, globular and oval in form, irregular in outline, variable in size, and provided with a small central nucleus.

PLATE 25.*

In the human fœtus, this fluid has been found by Sir Astley in too small proportion to be submitted to chemical analysis. But the thymic fluid of the fœtal calf, which exists in great abundance, gave the following analytical results: one hundred parts of the fluid contained sixteen parts of solid matter, which consisted of,

Incipient fibrine,
Albumen,
Mucus, and muco-extractive matter,
Muriate and phosphate of potass,
Phosphate of soda,
Phosphoric acid, a trace.

The *arteries* of the thymus gland are derived from the internal mammary and from the superior and inferior thyroid.

The *veins* terminate in the left vena innominata, and some small branches in the thyroid veins.

The *nerves* are very minute, and are derived chiefly through the internal mammary plexus, from the superior thoracic ganglion of the sympathetic.

The *lymphatics* terminate in the general union of the lymphatic vessels at the junction of the internal jugular and subclavian veins. Sir Astley Cooper has injected them only once in the human fœtus, but in the calf he finds two large lymphatic ducts, which commence in the upper extremities of the glands, and pass downwards, to terminate at the junction of the jugular and subclavian vein at each side. These vessels he considers the "*absorbent ducts* of the glands; '*thymic ducts;*' they are the carriers of the fluid from the thymus into the veins."

* *The Course and Termination of the Absorbent Ducts* of the thymus of the calf.—1. The two internal jugular veins. 2. Superior vena cava. 3. The thoracic duct, dividing into two branches, which re-unite previously to their termination in the root of the left jugular vein. 4. The two thymic ducts; that on the left side enters into the thoracic duct, and that on the right into the root of the right jugular vein.

Sir Astley concludes his anatomical description of this gland with the following interesting physiological observation :

"As the thymus secretes all the parts of the blood, viz. albumen, fibrine, and particles, is it not probable that the gland is designed to prepare a fluid well fitted for the fœtal growth and nourishment from the blood of the mother, before the birth of the fœtus, and, consequently, before chyle is formed from food? and this process continues for a short time after birth, the quantity of fluid secreted from the thymus gradually declining, as that of chylification becomes perfectly established."

FŒTAL LUNGS.

The *lungs*, previously to the act of inspiration, are dense and solid in structure, and of a deep red color; their specific gravity is greater than water, in which they sink to the bottom, whereas lung which has respired will float upon that fluid. The specific gravity is, however, no test of the real weight of the lung, the respired lung being actually heavier than the fœtal. Thus the weight of the fœtal lung, at about the middle period of uterine life, is to the body as 1 to 60. But after respiration, the relative weight of the lung to the entire body is as 1 to 30.

FŒTAL HEART.

The *heart* of the fœtus is large in proportion to the size of the body; it is also developed very early, representing at first a simple vessel, and undergoing various degrees of complication until it arrives at the compound character which it presents after birth. The two ventricles form, at one period, a single cavity, which is afterwards divided into two by the septum ventriculorum. The two auricles communicate up to the moment of birth, the septum being incomplete, and leaving a large opening between them, the *foramen ovale*.

The *ductus arteriosus* is another peculiarity of the fœtus connected with the heart; it is a communication between the pulmonary artery and the aorta. It degenerates into a fibrous cord after birth, from the double cause of a diversion in the current of the blood towards the lungs, and from the pressure of the left bronchus, caused by its distension with air.

VISCERA OF THE ABDOMEN.

At an early period of uterine life, and sometimes at the period of birth, two minute fibrous threads may be seen, passing from the umbilicus to the mesentery. These are the remains of the omphalo-mesenteric vessels.

The *omphalo-mesenteric* are the first developed vessels of the germ; they ramify upon the vesicula umbilicalis, or yolk-

bag, and supply the newly formed alimentary canal of the embryo. From them, as from a centre, the general circulating system is produced. After the establishment of the placental circulation, they cease to carry blood, and dwindle to the size of mere threads, which may be easily demonstrated in the early periods of uterine life; but are completely removed, except under peculiar circumstances, at a later period.

The *appendix vermiformis cœci* is long and of large size, and is continued directly from the central part of the cul-de-sac of the cæcum, of which it appears to be a constricted continuation. This is the character of the appendix cæci in the higher quadrumana.

The large intestines are filled with a dark green viscous secretion, called *meconium*, from its resemblance to the inspissated juice of the poppy.

FŒTAL LIVER.

The *liver* is the first formed organ in the embryo. It is developed from the alimentary canal, and at about the third week fills the whole abdomen, and is one half the weight of the entire embryo. At the fourth month the liver is of immense size in proportion to the bulk of the fœtus. At birth it is of very large size, and occupies the whole upper part of the abdomen. The left lobe is as large as the right, and the falciform ligament corresponds with the middle line of the body. The liver diminishes rapidly after birth, probably from the obliteration of the umbilical vein.

KIDNEYS AND SUPRA-RENAL CAPSULES.

The *kidneys* present a lobulated appearance in the fœtus, which is the permanent type amongst some animals, as in the bear, the otter, and cetacea.

The *supra-renal capsules* are organs which appear, from their early and considerable developement, to belong especially to the economy of the fœtus. They are distinctly formed at the second month of embryo life, and are greater in size and weight than the kidneys. At the fourth month they are equalled in bulk by the kidneys, and at birth they are about one third less than those organs.

VISCERA OF THE PELVIS.

The *bladder* in the fœtus is long and conical, and is situated altogether above the upper border of the pubis, which is as yet small and undeveloped. It is indeed an abdominal viscus, and is connected superiorly with a fibrous cord called the *urachus*, of which it appears an expansion.

The *urachus* is continued upwards to the umbilicus, and be-

comes connected with the umbilical cord. In animals it is a pervious duct, and is continuous with one of the membranes of the embryo—the *allantois*. It has been found pervious in the human fœtus, and the urine has been passed through the umbilicus. Calculous concretions have also been found in its course.

The *uterus* in the early periods of embryo existence appears to be bifid, from the large size of the Fallopian tubes, and the small developement of the body of the organ. At the end of the fourth month the body assumes a larger bulk, and the bifid appearance is lost. The cervix uteri in the fœtus is larger than the body of the organ.

The *ovaries* are situated, like the testicles, in the lumbar region, near to the kidneys, and descend from thence gradually into the pelvis.

TESTES.

The *testicles* in the embryo are situated in the lumbar regions, immediately below the kidneys. The spermatic canal at this period is occupied by a cellular cord of considerable thickness, called the *gubernaculum testis*. The cells of this structure appear to be filled with a gelatenous fluid; and its use would seem to be to keep the spermatic canal properly dilated, and to direct and precede the testicle in its course downwards. The upper extremity of the gubernaculum is attached to the posterior body of the testicle, and its lower end is connected with the cellular interior of the scrotum.

The descent of the testicle is very gradual and progressive. Between the fifth and sixth month it has reached the lower part of the psoas muscle, and during the seventh it makes its way through the spermatic canal, and is drawn onwards by the gubernaculum.

While situated in the lumbar region, it is behind the peritoneum, and is covered on its anterior surface and sides by that membrane, which constitutes its proper serous covering, the *tunica vaginalis propria*. As it descends into the scrotum, it carries with it its investing peritoneum, and thus forms a pouch of serous membrane, which communicates with the cavity of the peritoneum. This pouch being constricted by the spermatic canal, becomes gradually closed from above downwards, until it leaves only a small bag, which surrounds the testicle, and forms the *tunica vaginalis reflexa*.

ON THE MUSCLES.

Muscles are the moving organs of the animal frame; they constitute by their size and number the great bulk of the body, upon which they bestow form and symmetry. In the limbs, they are situated around the bones, which they invest and defend, and they form to some of the joints a principal protection. In the trunk, they are spread out to enclose cavities, and constitute a defensive wall, capable of yielding to internal pressure, and again returning to its original form.

Their color presents the deep red which is characteristic of flesh, and their form is variously modified, to execute the varied range of movements which they are required to effect.

Muscle is composed of a number of parallel fibres placed side by side, and supported and held together by a delicate web of cellular tissue; so that if it were possible to remove the muscular substance, there would remain a beautiful cellular framework, possessing the exact form and size of the muscle, without its color and solidity. Towards the extremity of the organ the muscular fibre ceases, and the cellular structure becomes aggregated and modified, so as to give rise to those glistening fibres and cords by which the muscle is tied to the surface of bone, and which are called *tendons*. Almost every muscle in the body is connected with bone, either by tendinous fibres, or by an aggregation of those fibres constituting a tendon, and the union is so firm that under extreme violence the bone itself rather breaks than permits the separation of the tendon from its attachment. In the broad muscles, the tendon is spread so as to form an expansion called *aponeurosis*, a nerve widely spread out.

Muscles present various modifications in the arrangement of their fibres in relation to the tendinous structure. Sometimes they are completely longitudinal, and terminate at each extremity in tendon, the entire muscle being *fusiform* in its shape; in other situations they are disposed of like the rays of a fan, converging to a tendinous point, as the temporal, pectoral, glutei, &c., and constitute a *radiate* muscle. Again they are *penniform*, converging like the plumes of a pen to one side of a tendon which runs the whole length of the muscle, as in the peronei; or *bipenniform*, converging to both sides of the tendon. In other muscles, the fibres pass obliquely from the surface of a tendinous expansion spread out on one side, to that of another extended on the opposite side, as in the semimembranosus; or they are composed of penniform or bipenniform fasciculi, as in the deltoid, and constitute a compound muscle.

The nomenclature of the muscles is defective and confused, and is generally derived from some prominent character which each muscle presents. Thus, some are named from their situ-

aiion, as the tibialis, peroneus; others from their uses, as the flexors, extensors, adductors, abductors, levators, tensors, &c. Some again from their form, as the trapezius, triangularis, deltoid, &c.; and others from their direction, as the rectus, obliquus, transversalis, &c. Some have received names expressive of their attachments, as the sterno-mastoid, sterno-hyoid, &c.; and others of their divisions, as the biceps, triceps, digastricus, complexus, &c.

In the description of a muscle, we express its attachment by the words origin and insertion. The term *origin* is generally applied to the more fixed or central attachment, or to the point towards which the motion is directed, while *insertion* is assigned to the more movable point, or to that most distant from the centre; but there are many exceptions to this principle, and as many muscles pull equally by both extremities, the use of such terms must be regarded as purely arbitrary.

In structure, muscle is composed of bundles of fibres of variable size called fasciculi, and is enclosed in a cellular membranous investment or sheath, which is continuous with the cellular frame work of the fibres. Each *fasciculus* is composed of a number of smaller bundles, and these of single fibres, which from their minute size and independent appearance have been distinguished by the name of ultimate fibres. The *ultimate fibre* is found by microscopic investigation to be itself made up of a number of *ultimate fibrils*, enclosed in a delicate sheath, or myolema. Two kinds of ultimate muscular fibres exist in the animal economy, viz. that of voluntary or animal life, and that of involuntary or organic life.

The *fibre of animal life* is recognized from being marked by transverse and slightly waving striæ; while the *fibre of organic life* is known by the negative character of an absence of transverse striæ.

The *ultimate fibrils* are minute, beaded or varicose filaments in the fibre of animal life, and cylindrical and uniform in the organic fibre.

Muscles are divided into two great classes, voluntary and involuntary, to which may be added as an intermediate and connecting link, the muscle of the vascular system—the heart.

The *voluntary*, or *system of animal life*, is developed from the external or serous layer of the germinal membrane, and comprehends the whole of the muscles of the limbs and of the trunk. The *involuntary*, or *organic system*, is developed from the internal or mucous layer, and constitutes the thin muscular structure of the intestinal canal, bladder, and internal organs of generation. At the commencement of the alimentary canal, in the œsophagus and near its termination in the rectum, the muscular coat is formed by a blending of the fibres of both classes.

The heart is developed from the middle or vascular layer of the germinal membrane; and although involuntary in its action, is composed of ultimate fibres, having the transverse striæ of the muscles of animal life.

The muscles may be arranged in conformity with the general division of the body, into—1. those of the head and neck; 2. those of the trunk; 3. those of the upper extremity; 4. those of the lower extremity.

MUSCLES OF THE HEAD AND NECK.

The muscles of the head and neck admit of a subdivision into those of the head and face, and those of the neck.

Dissection.—The *occipito-frontalis* is to be dissected by making a longitudinal incision along the vertex of the head, from the tubercle on the occipital bone to the root of the nose, and a second incision along the forehead and around the side of the head, to join the two extremities of the preceding. Dissect the integument and superficial fascia carefully outwards, beginning at the anterior angle of the flap, where the muscular fibres are thickest, and remove it altogether. This dissection requires care; for the muscle is very thin, and without attention would be raised with the integument. There is no deep fascia on the face and head, nor is it required; for here the muscles are closely applied against the bones upon which they depend for support, whilst in the extremities the support is derived from the dense layer of fascia by which they are invested, and which forms for each a distinct sheath.

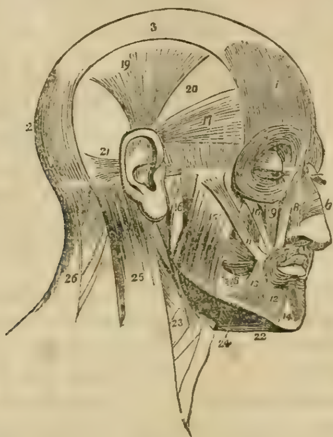
The *occipito-frontalis* is a broad musculo-tendinous layer, which covers the whole of one side of the vertex of the skull, from the occiput to the eyebrow. It *arises* from the outer two thirds of the superior curved line of the occipital bone, and from the mastoid portion of the temporal, and is *inserted* into the orbicularis palpebrarum muscle and nasal tuberosity of the frontal bone. The muscle is fleshy in front over the frontal bone, and behind over the occipital, the two portions being connected by a broad aponeurosis. The two muscles cover the whole of the vertex of the skull, hence its designation *galea capitis.* They are loosely adherent to the pericranium, but very closely to the integument, particularly over the forehead.

Action.—to raise the eyebrows, thereby throwing the integument of the forehead into tranverse wrinkles. Some persons have the power of moving the entire scalp upon the pericranium by means of these muscles.

Dissection.—The dissection of the face is to be effected by continuing the longitudinal incision of the vertex of the previous dissection onwards to the tip of the nose, and thence downwards to the margin of the upper lip; then carry an inci-

sion along the margin of the lip to the angle of the mouth, and transversely across the face to the meatus auditorius. Lastly, divide the integument in front of the external ear upwards to the transverse incision which was made for exposing the occipito-frontalis. Dissect the integument and superficial fascia from the region included by these incisions, and the three next groups of muscles (see 4 on plate 26) will be brought into view.

PLATE 26.*



Dissection.—To open the orbit, (pl. 27,) the calvarium and brain being removed, the frontal bone must be sawn through at the inner extremity of the orbital ridge, and externally at its outer extremity. The roof of the orbit may then be comminuted with the hammer, a process easily accomplished, on account of the thinness of the orbital plate of the frontal bone and lesser wing of the sphenoid. The superciliary portion of the orbit may now be driven forwards by a smart blow, and the broken

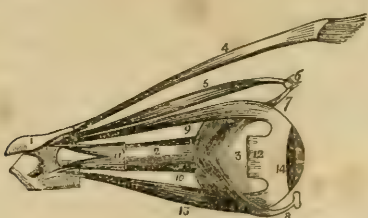
* *The Muscles of the Head and Face.*—1. The frontal portion of the occipito-frontalis. 2. Its occipital portion. 3. Its aponeurosis. 4. The orbicularis palpebrarum, which conceals the corrugator supercilii and tensor tarsi. 5. The pyramidalis nasi. 6. The compressor nasi. 7. The orbicularis oris. 8. The levator labii superioris alæque nasi. 9. The levator labii superioris proprius; the lower part of the levator anguli oris is seen between the muscles 10 and 11. 10. The zygomaticns minor. 11. The zygomaticus major. 12. The depressor labii inferioris. 13. The depressor anguli oris. 14. The levator menti. 15. The superficial portion of the masseter. 16. Its deep portion. 17. The attrahens aurem. 18. The buccinator. 19. The attollens aurem. 20. The temporal fascia which covers in the temporal muscle. 21. The retrahens aurem. 22. The anterior belly of the digastricus muscle; the tendon is seen passing through its aponeurotic pulley. 23. The stylo-hyoid muscle, pierced by the posterior belly of the digastricus. 24. The mylo-hyoideus muscle. 25. The upper part of the sterno-mastoid. 26. The upper part of the trapezius.

fragments of the roof of the orbit removed. The periosteum will then be exposed unbroken and undisturbed. Remove the periosteum from the whole of the upper surface of the exposed orbit, and the muscles may then be examined.

Actions.—The levator palpebræ raises the upper eyelid. The four recti, acting singly, pull the eyeball in the four directions of upwards, downwards, inwards, and outwards. Acting by pairs, they carry the eyeball in the diagonal of these directions, viz. upwards and inwards, upwards and outwards, downwards and inwards, or downwards and outwards. Acting all together, they directly retract the globe within the orbit. The superior oblique muscle acting alone, rolls the globe inwards and forwards, and carries the pupil outwards and downwards to the lower and outer angle of the orbit. The inferior oblique, acting alone, rolls the globe outwards and backwards, and carries the pupil outwards and upwards, to the upper and outer angle of the eye. Both muscles acting together, draw the eyeball forwards, and give the pupil that slight degree of eversion which enables it to admit the largest field of vision.

Dissection (for plate 28).—Make an incision along the upper border of the zigoma, for the purpose of separating the temporal fascia from its attachment. Then saw through the zygomatic process of the malar bone, and through the root of the zygoma, near to the meatus auditorius. Draw down the zygoma, and with it the origin of the masseter, and dissect the latter muscle away from the ramus and angle of the inferior maxilla. Now

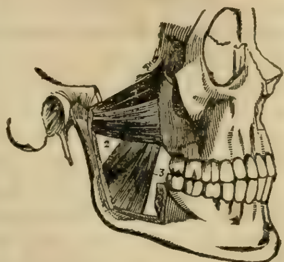
PLATE 27.*



* *The Muscles of the Eyeball*—the view being taken from the outer side of the right orbit.—1. A small fragment of the sphenoid bone around the entrance of the optic nerve into the orbit, 2. The optic nerve. 3. The globe of the eye. 4. The levator palpebræ muscle. 5. The superior oblique muscle. 6. Its cartilaginous pulley. 7. Its reflected tendon. 8. The inferior oblique muscle; the small square knob at its commencement is a piece of its bony origin broken off. 9. The superior rectus. 10. The external rectus, almost concealed by the optic nerve. 11. Part of the internal rectus, showing its two heads of origin. 12. The extremity of the external rectus at its insertion; the intermediate portion of the muscle having been removed. 13. The inferior rectus. 14. The tunica albuginea, formed by the expansion of the tendons of the four recti.

remove the temporal fascia from the rest of its attachment, and the whole of the temporal muscle will be exposed.

PLATE 28.*



Actions.—The maxillary muscles are the active agents in mastication, and form an apparatus beautifully fitted for that office. The buccinator circumscribes the cavity of the mouth, and with the aid of the tongue keeps the food under the immediate pressure of the teeth. By means of its connection with the superior constrictor it shortens the cavity of the pharynx, from before backwards, and becomes an important auxiliary in deglutition. The temporal, the masseter, and the internal pterygoid, are the bruising muscles, drawing the lower jaw against the upper with great force. The two latter, by the obliquity of their direction, assist the external pterygoid in grinding the food, by carrying the lower jaw forward upon the upper; the jaw being brought back again by the deep portion of the masseter and posterior fibres of the temporal. The whole of these muscles, acting in succession produce a rotary movement of the teeth upon each other, which, with the direct action of the lower jaw against the upper, effects the proper mastication of the food.

Dissections (for plate 29).—The dissection of the neck should be commenced by making an incision along the middle line of the neck from the chin to the sternum, and bounding it superiorly and inferiorly by two transverse incisions, the superior one being carried along the margin of the lower jaw, and across the mastoid process to the tubercle on the occipital bone, the inferior one along the clavicle to the acromion process. The square flap of integument thus included should be turned back from the entire side of the neck, which brings into view the superficial fascia, and on the removal of a thin layer of superficial fascia the platysma myoides will be exposed.

The sterno-hyoid, sterno-thyroid, thyro-hyoid and omo-hyoid muscles are brought into view by removing the deep fascia from off the front of the neck between the two sterno-mastoid muscles. The omo-hyoid, to be seen in its whole extent, requires that the sterno-mastoid muscle be divided from its origin and turned aside.

Actions.—The sterno-mastoids are the great anterior muscles

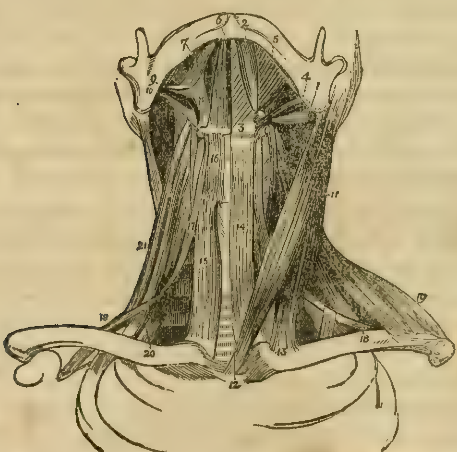
* *The two Pterygoid Muscles.* The zygomatic arch and the greater part of the ramus of the lower jaw have been removed, in order to bring these muscles into view.—1. The spenoidal origin of the external pterygoid muscle. 2. Its pterygoid origin. 3. The internal pterygoid muscle.

of connection between the thorax and the head. Both muscles acting together will bow the head directly forwards. The clavicular portions, acting more forcibly than the sternal, give stability and steadiness to the head in supporting great weights. Either muscle acting singly would draw the head towards the shoulder of the same side, and carry the face towards the opposite side.

Actions.—The sterno-hyoid, sterno-thyroid, thyro-hyoid and omo-hyoid, are the depressors of the os hyoides and larynx.

The digastricus, the stylo, mylo, and genio hyoids, and the genio-hyo-glossus, act upon the os hyoides when the lower jaw is closed, and upon the lower jaw when the os hyoides is drawn downwards, and fixed by the depressors of the os hyoides and larynx.

PLATE 29.*

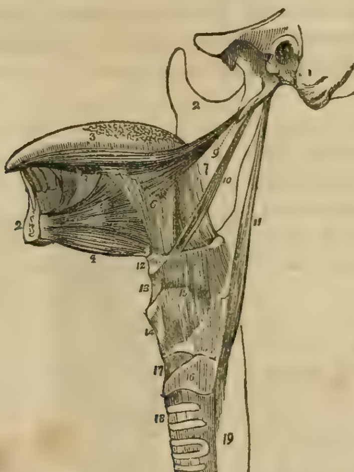


* *The Muscles of the anterior aspect of the Neck.*—On the left side the superficial muscles are seen, and on the right the deep. 1. The posterior belly of the digastricus muscle. 2. Its anterior belly. The aponeurotic pulley, through which its tendon is seen passing, is attached to the body of the os hyoides (3). 4. The stylo-hyoideus muscle, transfixed by the posteror belly of the digastricus. 5. The mylo-hyoideus. 6. The genio-hyoideus. 7. The tongue. 8. The hyo-glossus. 9. The stylo-glossus. 10. The stylo-pharyngeus. 11. The sterno-mastoid muscle. 12. Its sternal origin. 13. Its clavicular origin. 14. The sterno-hyoid. 15. The sterno-thyroid of the right side. 16. The thyro hyoid. 17. The hyoid portion of the omo-hyoid. 18, 18. Its scapular portion; on the left side the tendon of the muscle is seen to be bound down by a portion of the deep cervical fascia. 19. The clavicular portion of the trapezius. 20. The scalenus anticus of the right side. 21. The scalenus postieus.

Dissection (for plate 30.)—The digastricus, stylo hyoid, mylo-hyoid, genio-hyoid and genio-hyo-glossus, are best dissected by placing a high block beneath the neck, and throwing the head backwards. The integument has already been dissected away, and the removal of the cellular tissue and fat brings them clearly into view.

Actions.—The genio-hyo-glossus muscle effects several movements of the tongue, as might be expected from its extent. When the tongue is steadied and pointed by the other muscles, the posterior fibres of the genio-hyo-glossus would dart it from the mouth, while its anterior fibres would restore it to its original position. The whole length of the muscle acting upon the tongue, would render it concave along the middle line, and form a channel for the current of fluid towards the pharynx, as in sucking. The apex of the tongue is directed to the roof of the mouth, and rendered convex from before backwards by the linguales. The hyo-glossi, by drawing down the sides of the

PLATE 30.*



* *The Styloid Muscles, and the Muscles of the Tongue.*—1. A portion of the temporal bone of the left side of the skull, including the styloid and mastoid processes, and meatus auditorius externus. 2, 2. The right side of the lower jaw, divided at its symphysis, the left side having been removed. 3. The tongue. 4. The genio-hyoideus muscle. 5. The genio-hyo-glossus. 6. The hyo-glossus muscle—its basio-glossus portion. 7. Its cerato-glossus portion. 8. The anterior fibres of the lingualis, issuing from between the hyo-glossus and genio-hyo-glossus. 9. The stylo-glossus muscle, with a small portion of the stylo-maxillary ligament. 10. The stylo-hyoid. 11. The stylo-pharyngeus muscle. 12. The os hyoides. 13. The thyro-hyoidean membrane. 14. The thyroid cartilage. 15. The thyro-hyoideus muscle, arising from the oblique line on the thyroid cartilage. 16. The cricoid cartilage. 17. The crico-thyroidean membrane, through which the operation of laryngotomy is performed. 18. The trachea. 19. The commencement of the œsophagus.

tongue, render it convex along the middle line. It is drawn upwards at its base by the palato-glossi, and backwards or to either side by the stylo-glossi. Thus the whole of the complicated movements of the tongue may be explained, by reasoning upon the direction of the fibres of the muscles, and their probable actions.

Dissection (for plate 31).—To dissect the pharynx, the trachea and œsophagus are to be cut through at the lower part of the neck, and drawn upwards by dividing the loose cellular tissue which connects the pharynx to the vertebral column. The saw is then to be applied behind the styloid processes, and the base of the skull sawn through. The vessels and loose structures should be removed from the preparation, and the pharynx stuffed with tow or wool, for the purpose of distending it, and rendering the muscles more easy of dissection.

Actions.—The three constrictor muscles contract upon the morsel of food as soon as it is received by the pharynx, and convey it gradually downwards into the œsophagus. The stylo-pharyngei draw the pharynx upwards, and widen it laterally. The palato-pharyngei also draw it upwards, and narrow the opening of the fauces.

PLATE 31*.

* *A Side View of the Muscles of the Pharynx.*—1. The trachea. 2. The cricoid cartilage. 3. The crico-thyroid membrane. 4. The thyroid cartilage. 5. The thyro-hyoidean membrane. 6. The os hyoides. 7. The stylo-hyoidean ligament. 8. The œsophagus. 9. The inferior constrictor. 10. The middle constrictor. 11. The superior constrictor. 12. The stylo-pharyngeus muscle passing down between the superior and middle constrictor. 13. The upper concave border of the superior constrictor; at this point the muscular fibres of the pharynx are deficient. 14. The pterygo-maxillary ligament. 15. The buccinator muscle. 16. The orbicularis oris 17. The mylo-hyoideus.

PLATE 32*.

Dissection (for plate 32).—To examine these muscles, the pharynx must be opened from behind, and the mucous membrane carefully removed from off the posterior surface of the soft palate. The levator palati muscle must be turned down from its origin on one side and removed, and the superior constrictor dissected away from its pterygoid origin, to bring the tensor palati into view.

Actions.—The levator palati raises the soft palate, while the tensor spreads it out laterally so as to form a septum between the pharynx and posterior nares during deglutition. The palato-glossus and pharyngeus constrict the opening of the fauces, and by drawing down the soft palate they serve to press the mass of food from the dorsum of the tongue into the pharynx.

Dissection (for plate 33).—The muscles have already been exposed, by the removal of the face from the anterior aspect of the vertebral column.

Actions.—The rectus anticus major and minor preserve the equilibrium of the head upon the atlas; and, acting conjointly with the longus colli, they flex and rotate the head and the cervical portion of the vertebral column. The scaleni muscles, taking their fixed point from below, are flexors of the vertebral column; and, from above, elevators of the ribs, and therefore inspiratory muscles.

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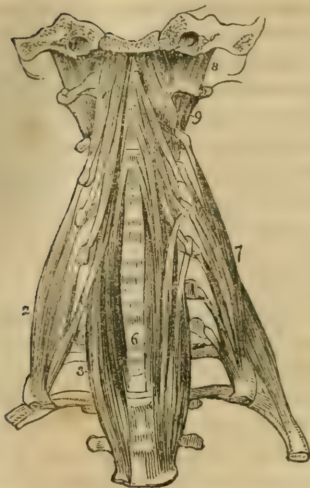
* *The Muscles of the Soft Palate.*—1. A transverse section through the middle of the base of the skull, dividing the basilar process of the occipital bone in the middle line, and the petrous portion of the temporal bone at each side. 2. The vomer, covered by mucous membrane and separating the two posterior nares. 3, 3. The Eustachian tubes. 4. The levator palati muscle of the left side; the right has been removed. 5. The hamular process of the internal pterygoid-plate of the left side, around which the aponeurosis of the tensor palati is seen turning. 6. The pterygo-maxillary ligament. 7. The superior constrictor muscle of the left side, turned aside. 8. The azygos uvulæ muscle. 9. The internal pterygoid plate. 10. The external pterygoid plate. 11. The tensor palati muscle. 12. Its aponeurosis, expanding in the structure of the soft palate. 13. The external pterygoid muscle. 14. The attachments of two pairs of muscles cut short. The superior pair belong to the genio-hyoglossi muscles; the inferior pair to the genio-hyoidei. 15. The attachment of the mylo-hyoideus of one side and part of the opposite. 16. The anterior attachments of the digastric muscles. 17. The depression on the lower jaw, corresponding with the submaxillary gland. The depression above the mylo-hyoideus on which the number 15 rest corresponds with the sublingual gland.

PLATE 33.*



Dissections (for plates 33 and 34).—The muscles of the first layer are to be dissected by making an incision along the middle line of the back, from the tubercle on the occipital bone to the coccyx. From the upper point of this incision, carry a second along the side of the neck, to the middle of the clavicle. Inferiorly, an incision must be made from the extremity of the sacrum, along the crest of the ileum, to about its middle. For convenience of dissection, a fourth may be carried from the middle of the spine to the acromion process. The integument and superficial fascia, together, are to de dissected off the muscles, in the course of their fibres, over the whole of this region.

The second layer is brought into view by dividing the two preceding muscles, near to their insertion, and turning them to the opposite side.

The third layer consists of muscles which arise from the spinous processes of the vertebral column, and pass outwards. It is brought into view by dividing the levator anguli scapulæ near its insertion, and reflecting the two rhomboid muscles upwards from their insertion into the scapula, and removing them altogether.

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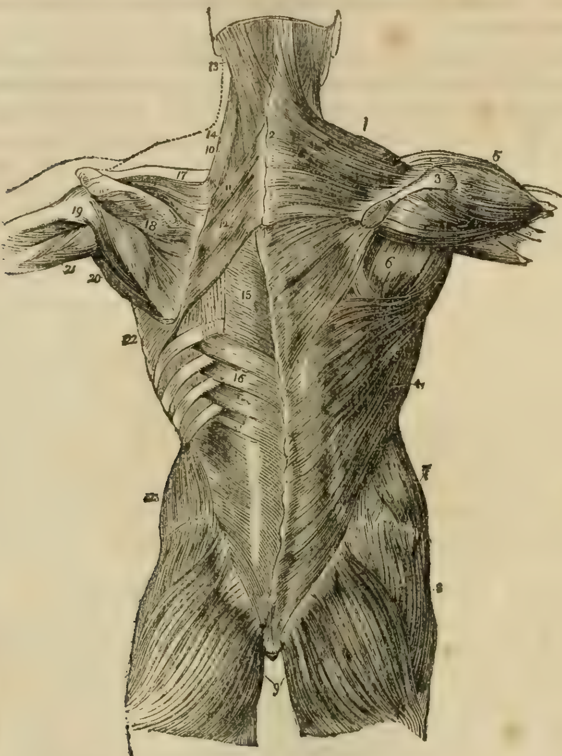
* *The Prævertebral Group of Muscles of the Neck.*—1. The rectus anticus major muscle. 2. The scalenus anticus. 3. The lower part of the longus colli of the right side; it is concealed superiorly by the rectus anticus major. 4. The rectus anticus minor. 5. The upper portion of the longus colli muscle. 6. Its lower portion; the figure rests upon the seventh cervical vertebra. 7. The scalenus posticus. 8. The rectus lateralis of the lef side.t 9. One of the intertransversalis muscles.

The two serrati and two splenii must be removed by cutting them away from their origins and insertions, to bring the fourth layer into view.

PLATE 34.*

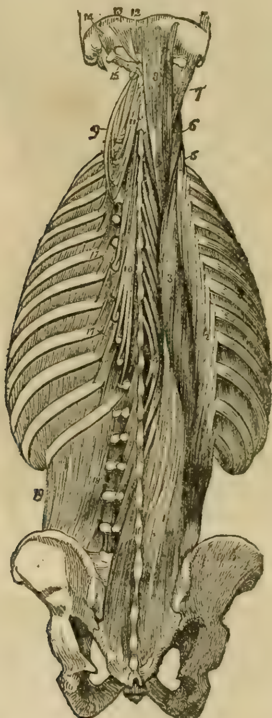


* *The first and second, and part of the third layer of Muscles of the Back;* the first layer being shown upon the right, and the second on the left side.—1. The trapezius muscle. 2. The tendinous portion, which, with a corresponding portion in the opposite muscle, forms the tendinous ellipse on the back of the neck. 3. The acromion process and spine of the scapula. 4. The latissimus dorsi muscle. 5. The deltoid. 6. The muscles of the dorsum of the scapula, infra-spinatus, teres minor and teres major. 7. The external oblique muscle. 8. The gluteus medius. 9. The glutei maximi. 10. The lavator anguli scapulæ. 11. The rhomboideus minor. 12. The rhomboideus major. 13. The splenius capitis; the muscle immediately above and overlaid by the splenius, is the complexus. 14. The splenius colli only partially seen; the common origin of the splenius is seen attached to the spinous processes below the lower border of the rhomboideus major. 15. The vertebral aponeurosis. 16. The serratus posticus inferior. 17. The supra-spinatus muscle. 18. The infra-spinatus. 19. The teres minor muscle 20. The teres major. 21. The long head of the triceps, passing between the teres minor and major to the upper arm. 22. The serratus magnus, proceeding forwards from its origin at the base of the scapula. 23. The internal oblique muscle.

The muscles of the preceding layer are to be removed by dividing them transversely through the middle, and turning one extremity upwards, the other downwards. In this way the whole of the muscles of the fourth layer may be got rid of, and the remaining muscles of the spine brought into a state to be examined.

The semi-spinales muscles must both be removed to obtain a good view of the multifidus spinæ which lies beneath them, and fills up the concavity between the spinous and transverse processes, the whole length of the vertebral column.

PLATE 35.*



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* *The fourth and fifth and part of the sixth layer of the Muscles of the Back.* 1. The common origin of the erector spinæ muscle. 2. The sacro-lumbalis. 3. The longissimus dorsi. 4. The spinalis dorsi. 5. The cervicalis ascendens. 6. The transversalis colli. 7. The trachelo-mastoideus. 8. The complexus. 9. The transversalis colli, showing its origin. 10. The semispinalis dorsi. 11. The semispinalis colli. 12. The rectus posticus minor. 13. The rectus posticus major. 14. The obliquus superior. 15. The obliquus inferior. 16. The multifidus spinæ. 17 The levatores costarum. 18. Intertransversales. 19. The quadratus lumborum.

Actions.—The upper fibres of the trapezius draw the shoulder upwards and backwards; the middle fibres, directly backwards; and the lower, downwards and backwards. The lower fidres also act by producing rotation of the scapula upon the chest. If the shoulder be fixed the upper fibres will flex the spine towards the corresponding side. The latissimus dorsi is a muscle of the arm, drawing it backwards and downwards, and at the same time rotating it inwards; if the arm be fixed, the latissimus dorsi will draw the spine to that side, and raising the lower ribs be an inspiratory muscle; and if both arms be fixed, the two muscles will draw the whole trunk forwards, as in climbing or walking on crutches. The levator anguli scapulæ lifts the upper angle of the scapula, and with it the entire shoulder, and the rhomboidei carry the scapula and shoulder upwards and backwards.

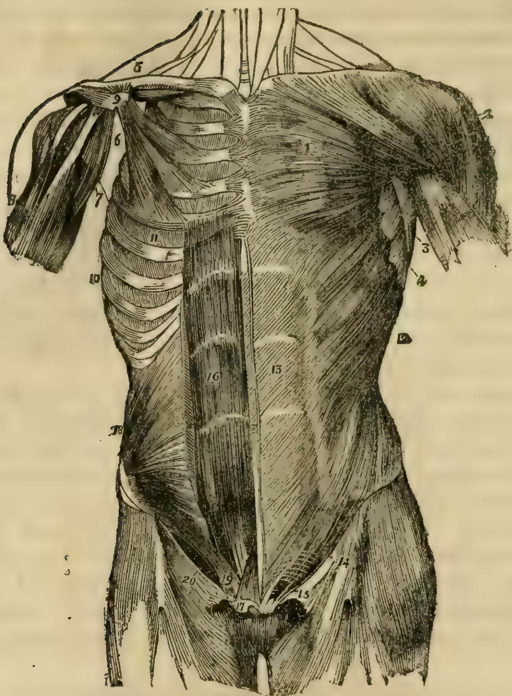
The serrati are respiratory muscles acting in opposition to each other—the *serratus posticus superior*, drawing the ribs upwards, and thereby expanding the chest; and the *inferior*, drawing the lower ribs downwards and diminishing the cavity of the chest. The former is an inspiratory, the latter an expiratory muscle. The splenii muscles of one side draw the vertebral column backwards and to one side, and rotate the head towards the corresponding shoulder. The muscles of opposite sides acting together, will draw the head directly backwards. They are the natural antagonists of the sterno-mastoid muscles.

The *sacro-lumbalis*, with its *accessory muscle*, the *longissimus dorsi* and *spinalis dorsi*, are known by the general term of *erector spine*, which sufficiently expresses their actions. They keep the spine supported in the vertical position by their broad origin from below, and by means of their insertion by distinct tendons into the ribs and spinous processes. Being made up of a number of distinct fasciculi, which alternate in their actions, the spine is kept erect without fatigue, even when they have to counterbalance a corpulent abdominal developement. The continuations upwards of these muscles into the neck preserve the steadiness and uprightness of that region. When the muscles of one side act alone, the neck is rotated upon its axis. The *complexus*, by being attached to the occipital bone, draws the head backwards, and counteracts the muscles on the anterior part of the neck. It assists also in the rotation of the head.

The *semi-spinales* and *multifidus spine* muscles act directly on the vertebræ, and contribute to the general action of supporting the vertebral column erect.

The four little muscles situated between the occiput and the two first vertebræ, effect the various movements between these

PLATE 36.*



* *The Muscles of the Anterior Aspect of the Trunk.*—On the left side the superficial layer is seen, and on the right the deeper layer. 1. The pectoralis major muscle. 2. The deltoid; the interval between these muscles lodges the cephalic vein. 3. The anterior border of the latissimus dorsi. 4. The serrations of the serratus magnus. 5. The subclavius muscle of the right side. 6. The pectoralis minor. 7. The coraco-brachialis muscle. 8. The upper part of the biceps muscle, showing its two heads. 9. The coracoid process of the scapula. 10. The serratus magnus of the right side. 11. The external intercostal muscle of the fifth intercostal space. 12. The external oblique muscle. 13. Its aponeurosis, the median line to the right of this number is the linea alba; the flexuous line to its left is the linea semilunaris; and the transverse lines above and below the number, the linæ transversæ of which there were only three in this subject. 14. Poupart's ligament. 15. The external abdominal ring; the margin above the ring is the superior or internal pillar; the margin below the ring, the inferior or external pillar; the curved intercolumnar fibres are seen proceeding upwards from Poupart's ligament to strengthen the ring. The numbers 14 and 15 are situated upon the fascia lata of the thigh; the opening immediately to the right of 15 is the saphenous opening. 16. The rectus muscle of the right side, brought into view by the removal of the anterior segment of its sheath; the posterior segment of its sheath with the divided edge of the anterior segment. 17. The pyramidalis muscle. 18. The internal oblique muscle. 19. The conjoined tendon of the internal oblique and transversalis, descending behind Poupart's ligament to the pectineal line. 20. The arch formed between the lower curved border of the internal oblique and Poupart's ligament; it is beneath this arch that the spermatic cord and hernia pass.

bones; the *recti* producing the antero-posterior actions, and the *obliqui* the rotatory motions of the atlas on the axis.

The actions of the remaining muscles of the spine, the *supra* and *inter-spinales* and *intertransversales* are expressed in their names.

The intercostal muscles raise the ribs when they act from above, and depress them when they take their fixed point from below. They are, therefore, both inspiratory and expiratory muscles.

[The preceding dissection and action includes plate 36.]

PLATE 37.*

* *Lateral View of the Trunk of the Body*, showing its muscles, and particularly the transversalis abdominis.—1. The costal origin of the latissimus dorsi muscle. 2. The serratus magnus. 3. The upper part of the external oblique muscle, divided in the direction best calculated to show the muscles beneath without interfering with its digitations with the serratus magnus. 4. Two of the external intercostal muscles. 5. Two of the internal intercostals. 6. The transversalis muscle. 7. Its posterior aponeurosis. 8. Its anterior aponeurosis, forming the posterior boundary of the sheath of the rectus. 9. The lower part of the left rectus, with the aponeurosis of the transversalis passing in front. 10. The right rectus muscle. 11. The arched opening left between the lower border of the tranaversalis muscle and Poupart's ligament, through which the spermatic cord and hernia pass. 12. The gluteous maximus, and medius, and tensor vaginæ femoris muscles invested by fascia lata.

Dissection (for plate 37).—The dissection of the abdominal muscles is to be commenced by making three incisions:—The first, *vertical*, in the middle line, from over the lower part of the sternum to the pubes; the second, *oblique*, from umbilicus, upwards and outwards, to the outer side of the chest, as high as the fifth or sixth rib; and third, *oblique*, from the umbilicus, downwards and outwards, to the middle of the crest of the ilium. The three flaps included by these incisions should theu be dissected back in the direction of the fibres of the external oblique muscle, beginning at the angle of each. The integument and superficial fascia should be dissected off together so as to expose the fibres of the muscle at once.

If the external oblique muscle be dissected on both sides, a white tendinous line will be seen along the middle of the abdomen, extending from the ensiform cartilage to the pubis: this is the *linea alba*. A little external to it, on each side, two curved lines will be observed extending from the sides of the chest to the pubis, and bounding the recti muscles: these are the *lineæ semilunares*. Some transverse lines, *lineæ transversæ*, three or four in number, connect the lineæ semilunares with the linea alba.

The external oblique is now to be removed by making an incision across the ribs, just below its origin, to its posterior border, and another along Poupart's ligament and the crest of the ilium. Poupart's ligament should be left entire, as it gives attachment to the next muscles. The muscle may then be turned forwards towards the linea alba, or removed altogether.

The internal oblique muscle is to be removed by separating it from its attachment to the ribs above, and to the crest of the ilium, and Poupart's ligament below. It should be divided behind by a vertical incision extending from the last rib to the crest of the ilium, as its lumbar attachment cannot at present be examined. The muscle is then to be turned forwards. Care will be required in performing this dissection, from the difficulty of distinguishing between this muscle and the one beneath. A thin layer of cellular tissue is all that separates them for the greater part of their extent. Near the crest of the ilium the circumflex ilii artery ascends between the two muscles, and forms a valuable guide to their separation. Just above Poupart's ligament they are so closly connected that it is impossible to divide them.

To dissect the *rectus muscle*, the sheath should be opened by a vertical incision extending from over the cartilages of the lower ribs to the front of the pubis. The sheath may then be dissected off and turned to either side: this is easily done excepting at the lineæ transversæ, where a close adhesion subsists

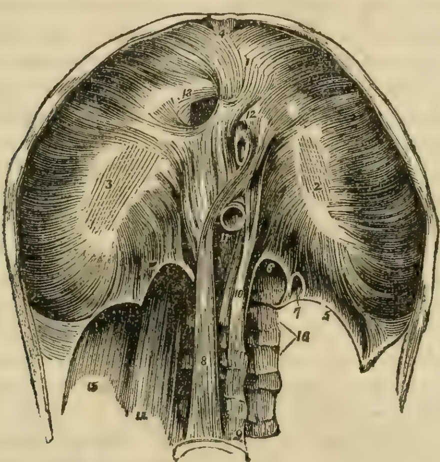
between the muscle and the external boundary of the sheath. The sheath contains the rectus and pyrimadalis muscles.

The rectus may now be divided across the middle, and the two ends drawn aside for the purpose of examining the mode of formation of its sheath.

The two next muscles can only be examined when the whole of the viscera are removed. To see the quadratus lumborum, it is also necessary to divide and draw aside the psoas muscle and the anterior lamella of the aponeurosis of the transversalis.

To obtain a good view of the diaphragm, the peritoneum should be dissected from its under surface.

PLATE 38.*



* *The under or abdominal side of the Diaphragm.*—1, 2, 3. The greater muscle; the figure 1 rests upon the central leaflet of the tendinous centre; the number 2 on the left or smallest, and number 3 on the right leaflet. 4. The thin fasciculus which arises from the ensiform cartilage; a small triangular space is left on either side of this fasciculus, which is completed only by the serous membranes of the abdomen and chest. 5. The ligamentum arcuatum externum of the left side. 6. The ligamentum arcuatum internum. 7. A small arched opening occasionally found, through which the lesser splanchnic nerve passes. 8. The right or larger tendon of the lesser muscle; a muscular fasciculus from this tendon curves to the left side of the greater muscle, between the œsophageal and aortic openings. 9. The fourth lumbar vertebra. 10. The left or shorter tendon of the lesser muscle. 11. The aortic opening through which the aorta is seen issuing. 12. A portion of the œsophagus issuing through the œsophageal opening. 13. The opening for the inferior vena cava, in the tendinous centre of the diaphragm. 14. The psoas magnus muscle passing beneath the ligamentum arcuatum internum ; it has been removed on the opposite side, to show the arch more distinctly. 15. The quadratus lumborum passing beneath the ligamentum arcuatum externum ; this muscle has also been removed on the left side. 16. Intertransversales muscles.

Actions.—The external oblique muscle, acting singly, would draw the thorax towards the pelvis, and twist the body to the opposite side. Both muscles, acting together, would flex the thorax directly on the pelvis. The internal oblique of one side draws the chest downwards and outwards: both together bend it directly forwards. Either transversalis muscle, acting singly, will diminish the size of the abdomen on its own side, and both together will constrict the entire cylinder of the cavity. The recti muscles, assisted by the pyramidales, flex the thorax upon the chest, and, through the medium of the lineæ transversæ, are enabled to act when their sheath is curved inwards by the action of the transversales. The pyramidales are tensors of the linea alba. The abdominal are expiratory muscles, and the chief agents of expulsion; by their action the fœtus is expelled from the uterus, the urine from the bladder, the fæces from the rectum, the bile from the gall-bladder, the ingesta from the stomach and bowels in vomiting, and the mucous and irritating substances from the bronchial tubes, trachea, and nasal passages, during coughing and sneezing. To produce these efforts they all act together. Their violent and continued action produces hernia; and, acting spasmodically, they may occasion rupture of the viscera. The quadratus lumborum draws the last rib downwards, and is an expiratory muscle; it also serves to bend the vertebral column to one or the other side. The psoas parvus is a tensor of the iliac fascia, and, taking its fixed origin from below, it may assist in flexing the vertebral column forwards. The diaphragm is an inspiratory muscle, and the sole agent in tranquil inspiration. When in action, the muscle is drawn downwards, its plane being rendered oblique from the level of the ensiform cartilage, to the upper lumbar vertebræ. During relaxation it is convex, and encroaches considerably on the cavity of the chest, particularly at the sides, where it corresponds with the lungs. It assists the abdominal muscles powerfully in expulsion, every act of that kind being preceded or accompanied by a deep inspiration. Spasmodic action of the diaphragm produces hiccough and sobbing, and its rapid alternation of contraction and relaxation, combined with laryngeal and fascial movements, laughing and crying.

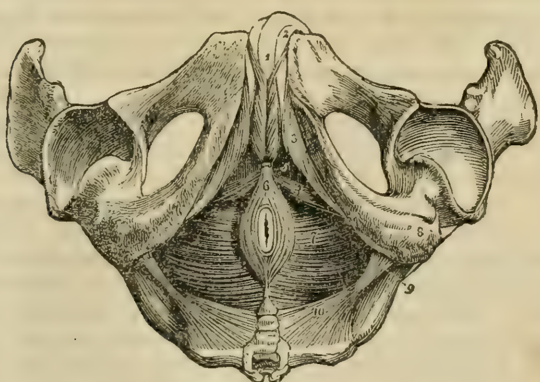
Muscles of the Perineum.

The muscles of the perineum are situated in the outlet of the pelvis, and consist of two groups, one of which belongs especially to the organs of generation and urethra, the other to the termination of the alimentary canal. To these may be added, the only pair of muscles which is proper to the pelvis, the coccygeus. The muscles of this region in the male, are, the

Accelerator urinæ,
Erector penis,
Transversus perinei,
Compressor urethræ,
Spincter ani,
Levator ani,
Coccygeus.

Dissection (for plate 39).—To dissect the perineum, the subject should be fixed in the position for lithotomy, that is, the hands should be bound to the soles of the feet, and the knees kept apart. An easier plan is the drawing of the feet upwards by means of a cord passed through a hook in the ceiling. Both of these means of preparation have for their object the full exposure of the perineum. And as this is a dissection which demands some degree of delicacy and nice manipulation, a strong light should be thrown upon the part. Having fixed the subject, and drawn the scrotum upwards by means of a string or hook, carry an incision from the base of the scrotum along the ramus of the pubis and ischium and tuberosity of the ischium, to a point parallel with the apex of the coccyx ; then describe a curve over the coccyx to the same point on the opposite side, and continue the incision onwards along the opposite tuberosity,

PLATE 39.*



* *The Muscles of the Perineum.*—1. The accelleratores urinæ muscles ; the figure rests upon the corpus spongiosum penis. 2. The corpus cavernosum of one side. 3. The erector penis of one side. 4. The transversus perinei of one side. 5. The triangular space through which the deep perineal fascia is seen. 6. The sphincter ani ; its anterior extremity is cut off. 7. The levator ani of the left side ; the large space between the tuberosity of the ischium (8) and the anus, is the ischio-rectal fossa ; the same fossa is seen upon the opposite side. 9. The spine of the ischium. 10. The left cocygeus muscle. The boundaries of the perineum are well seen in this engraving.

and ramus of the ischium, and ramus of the pubis, to the opposite side of the scrotum, where the two extremities may be connected by a transverse incision. This incision will completely surround the perineum, following very nearly the outline of its boundaries. Now let the student dissect off the integument carefully from the whole of the included space, and he will expose the fatty cellular structure of the common superficial fascia, which exactly resembles the superficial fascia in every other situation. The common superficial fascia is then to be rmoved to the same extent, exposing the superficial perineal fascia. This layer is also to be turned aside, when the muscles of the genital region of the perineum will be brought into view.

Part of the levator ani may be seen during the dissection of the anal portion of the perineum by removing the fat which surrounds the termination of the rectum. But to study the entire muscle, a lateral section of the pelvis must be made by sawing through the pubis a little to one side of the symphysis, separating the bones behind at the sacro-iliac symphysis, and turning down the bladder and rectum. The pelvic fascia is then to be carefully raised, beginning at the base of the bladder and proceeding upwards, until the whole extent of the muscle is exposed.

In the female this muscle is inserted into the coccyx and fibrous raphe—extremity of the rectum and vagina.

The muscles of the perineum in the female are the same as in the male, and have received analagous names. They are smaller in size, and are modified to suit the different form of the organs.

Actions.—The acceleratores urinæ being continuous at the middle line, and attached on each side to the bone, by means of their posterior fibres will support the bulbous portion of the urethra, and acting suddenly will propel the semen or the last drops of urine from the canal. The middle and posterior fibres, according to Krause, contribute towards the erection of the corpus spongiosum, by producing compression upon the venous structure of the bulb, and the anterior fibres, according to Tyrrell, assist in the erection of the entire organ, by compressing the vena dorsalis, by means of their insertion into the fascia penis. The erector penis becomes entitled to its name from spreading out upon the dorsum of the organ into a membranous expansion (fascia penis) which, according to Krause, compresses the dorsal vein during the action of the muscle, and especially after the erection of the organ has commenced. The transverse muscles serve to steady the tendinous center, that the muscles attached to it may obtain a firm point of support. According to Cruveilhier, they draw the anus backwards during

the expulsion of the fæces, and antagonise the levatores ani which carry the anus forwards. The compressor urethræ taking its fixed point from the ramus of the ischium at each side, can, says Mr. Guthrie, "compress the urethra so as to close it; I conceive completely, after the mauner of a sphincter." The transverse portion will also have a tendency to draw the urethra downwards, whilst the perpendicular portion will draw it upwards towards the pubis. The inferior fasciculus of the transverse muscle, enclosing Cowper's glands, will assist those bodies in evacuating their secretion. The *external sphincter* being a cutaneous muscle contracts the integument around the anus, and by its attachment to the tendinous centre, and to the point of the coccyx, assists the levator ani in giving support to the opening during expulsive efforts. the *internal sphincter* contracts the extremity of the cylinder of the intestine. The use of the levator ani is expressed in its name. It is the antagonist of the diaphragm and the rest of the expulsory muscles, and serves to support the rectum and vagina during their expulsive efforts. The levator ani acts in unison with the diaphragm, and rises and falls like that muscle in forcible respiration. Yielding to the propulsive action of the abdominal muscles, it enables the outlet of the pelvis to bear a greater force than a resisting structure, and on the remission of such actions, it restores the perineum to its original form. The coccygei muscles restore the coccyx to its natural position, after it has been pressed backwards during defecation or during parturition.

MUSCLES OF THE UPPER EXTREMITY.

Dissection.—Make an incision along the line of the clavicle from the upper part of the sternum to the acromion process; a second along the lower border of the great pectoral muscle, from the lower end of the sternum to the insertion of its tendon into the humerus; and connect the two by a third, carried longitudinally along the middle of the sternum. The integument and superficial fascia are to be dissected together from off the fibres of the muscle, and always in the direction of their course. For this purpose the dissector, if he have the right arm, will commence with the lower angle of the flap; if the left, with the upper angle. He will thus expose the pectoralis major muscle in its whole extent.

Actions.—The pectoralis major draws the arm against the thorax, while its upper fibres assist the upper part of the trapezius in raising the shoulder, as in supporting weight. The lower fibres depress the shoulder with the aid of the latissimus dorsi. Taking its fixed point from the shoulder, the pectoralis major assists the pectoralis minor, subclavius, aud serratus mag-

nus, in drawing up and expanding the chest. The pectoralis minor, in addition to this action, draws upon the coracoid process, and assists in rotating the scapula upon the chest. The subclavius draws the clavicle downwards and forwards, and thereby assists in steadying the shoulder. All the muscles of this group are agents in forced respiration, but are unable to act until the shoulders be fixed.

The serratus magnus is the great external inspiratory muscle, raising the ribs when the shoulders are fixed, and thereby increasing the cavity of the chest. Acting upon the scapula, it draws the shoulder forwards, as we see to be the case in diseased lungs, where the chest has become almost fixed from apprehension of the expanding action of the respiratory muscles.

The subscapularis rotates the head of the humerus inwards, and is a powerful defence to the joint. When the arm is raised, it draws the humeris downwards.

PLATE 40.*

Dissection (for plate 40).—The coraco-brachialis, biceps, and brachialis anticus are exposed on the removal of the integument and fascia from the anterior half of the upper arm, and clearing away the cellular tissue.

Actions.—The coraco-brachialis draws the humeris inwards, and assists in flexing it upon the scapula. The biceps and brachialis anticus are flexors of the fore arm, and the former a supinator. The brachialis anticus is a powerful protection to the elbow joint.

* *The Muscles of the anterior aspect of the Upper Arm.*—1. The coracoid process of the scapula. 2. the coraco-clavicular ligament (trapeziod) passing upwards to the scapular end of the clavicle. 3. The coraco-acromial ligament passing outwards to the acromion. 4. The subscapularis muscle. 5. The teres major. 6. The coraco-brachialis. 7. The biceps. 8. The upper end of the radius. 9. The brachialis anticus. 10. The internal head of the triceps. 11. Its external head. 12. A part of the third, or middle head. 13. The supinator longus muscle cut off.

Dissection (for plate 41).—Remove the integument and fascia from the posterior aspect of the upper arm.

Action.—The triceps is an extensor of the fore arm.

Dissection (for plate 42).—These muscles are seen by making an incision through the integument along the middle line

PLATE 41.*

PLATE 42.†

* *A Posterior View of the Upper Arm, showing the Triceps Muscle.*—1. Its external head. 2. Its long, or scapular head. 3. Its internal, or short head. 4. The olecranon process of the ulna. 5. the radius. 6. The capsular ligament of the shoulder joint.

† *A Superficial Layer of Muscles of the Fore Arm.*—1. The lower part of the biceps, with its tendon. 2. A part of the brachialis anticus, seen beneath the biceps. 3. A part of the triceps. 4. The pronator radii teres. 5. The flexor carpi radialis. 6. The palmaris longus. 7. One of the fasciculi of the flexor sublimis digitorum; the rest of the muscle is seen beneath the tendons of the palmaris longus and flexor carpi radialis. 8. The flexor carpi ulnaris. 9. The palmar fascia. 10. The palmaris brevis muscle. 11. The abductor pollicis muscle. 12. One portion of the flexor brevis pollicis. 13. The supinator longus muscle. 14. The extensor ossis metacarpi, and primi internodii pollicis, curving around the lower border of the fore arm.

of the fore arm, crossing each extremity by a transverse incision, and turning aside the flaps. The superficial and deep fascia are then to be removed.

Dissection (for plate 43).—This group is brought into view by removing the flexor sublimis, and drawing aside the pronator radii teres.

Actions.—The pronator radii teres and pronator quadratus

PLATE 43.*

PLATE 44.†

* *The Deep Layer of Muscles of the Fore Arm.*—1. Internal lateral ligament of the elbow joint. 2. The anterior ligament. 3. The orbicular ligament of the head of the radius. 4. The flexor profundus digitorum muscle. 5. The flexor longus pollicis. 6. The pronator quadratus. 7. The abductor pollicis muscle. 8. The dorsal interosseous muscle of the middle finger, and palmar interosseous of the ring finger. 9. The dorsal interosseous muscle of the ring finger, and palmer interosseous of the little finger.

† *The Superficial Layer of Muscles on the Posterior Aspect of the Fore Arm.*—1. The lower part of the biceps. 2. Part of the brachialis anticus. 3. The lower part of the triceps, inserted into the olecranon. 4. The supinator longus. 5. The extensor carpi radialis longius. 6. The extensor carpi radialis brevior. 7. The tendons of insertion of these two muscles. 8. The extensor communis digitorum. 9. The extensor minimi digiti. 10. The extensor carpi ulnaris. 11. The anconeus. 12. Part of the flexor carpi ulnaris. 13. The

muscles rotate the radius upon the ulna, and render the hand prone. The remaining muscles are flexors:—two flexors of the wrist, flexor carpi radialis and ulnaris; two of the fingers, flexor sublimis and profundus, the former flexing the second phalanges, the latter the last; one flexor of the last phalanx of the thumb, flexor longus pollicis. The palmaris longus is a tensor of the palmar fascia.

Dissection (for plate 44).—The integument is to be divided and turned aside, and the fasciæ removed in the same manner as for the anterior brachial region.

This muscle must be divided through the middle, and the two ends turned to either side, to expose the next muscle.

Dissection (for plate 45).—The muscles of the superficial layer should be removed, in order to bring the deep group completely into view.

Actions.—The anconeus is associated in its action with the triceps extensor cubiti: it assists in extending the fore arm upon the arm. The supinator longus and brevis effect the supination of the fore arm, and antagonize the two pronators. The extensor carpi radialis longior, and brevior, and ulnaris extend the wrist in opposition to the two flexors of the carpus. The extensor communis digitorum restores the fingers to the straight position, after being flexed by the two flexors, sublimis and profundus. The extensor ossis metacarpi, primi internodii, and secundi internodii pollicis, are the especial extensors of the thumb, and serve to balance the actions of the

PLATE 45.*

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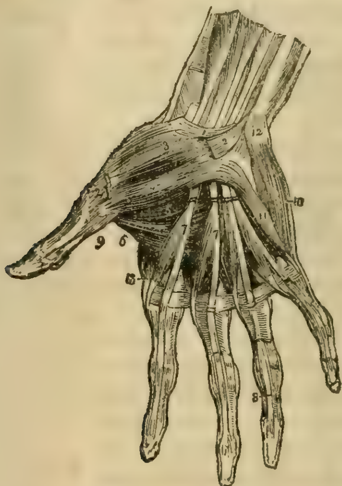
extensor ossis metacarpi and primi internodii muscles lying together. 14. The extensor secundi internodii; its tendon is seen crossing the two tendons of the extensor carpi radialis longior and brevior. 15. The posterior annular ligament. The tendons of the common extensor are seen upon the back of the hand, and their distribution on the dorsum of the fingers.

* *The Deep Layer of Muscles on the Posterior Aspect of the Fore Arm.*—1 The lower part of the humerus. 2. The olecranon. 3. The ulna. 4. The anconeus muscle. 5. The spinator brevis muscle. 6. The extensor ossis metacarpi pollicis. 7. The extensor primi internodii pollicis. 8. The extensor secundi internodii pollicis. 9. The extensor indicis. 10. The first dorsal interosseous muscle. The other three dorsal interossei are seen between the metacarpal bones of the other fingers.

flexor ossis metacarpi, flexor brevis, and flexor longus pollicis. The extensor indicis gives the character of extension to the index finger, and is hence named indicator, and the extensor minimi digiti supplies that finger with the power of exercising a distinct extension.

PLATE 46.*



Dissection (for plate 46.)—The hand is best dissected by making an incision along the middle of the palm, from the wrist to the base of the fingers, and crossing it at each extremity by a transverse incision, then turning aside the flaps of integument. For exposing the muscles of the radial region, the removal of the integument and fascia on the radial side will be sufficient.

The flexor ossis metacarpi may now be divided from its origin and turned aside, in order to show the next muscle.

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* *The Muscles of the Hand.*—1. The annular ligament. 2, 2. The origin and insertion of the abductor pollicis muscle; the middle portion has been removed. 3. The flexor ossis metacarpi, or opponens pollicis. 4. One portion of the flexor brevis pollicis. 5. The deep portion of the flexor brevis pollicis. 6. The adductor pollicis. 7, 7. The lumbricales muscles, arising from the radial side of the deep flexor tendons, upon which the numbers are placed. The tendons of the flexor sublimis have been removed from the palm of the hand. 8. The tendon of the deep flexor, passing between the two terminal slips of the tendon of the flexor sublimis to reach the last phalanx. 9. The tendon of the flexor longus pollicis, passing between the two portions of the flexor brevis to the last phalanx. 10. The abductor minimi digiti. 11. The flexor brevis minimi digiti. The edge of the flexor ossis metacarpi, or abductor minimi digiti, is seen projecting beyond the inner border of the flexor brevis. 12. The prominence of the pisiform bone. 13. The first dorsal interosseous muscle.

Turn aside the ulnar flap of integument in the palm of the hand; in doing this a small subcutaneous muscle, the palmaris brevis, will be exposed. After examining this muscle, remove it with the deep fascia, in order to bring into view the muscles of the little finger.

Actions.—The actions of the muscles of the hand are expressed in their names. Those of the radial region belong to the thumb, and provide for three of its movements, ***abduction***, ***adduction***, and ***flexion***. The ulnar group, in like manner, is subservient to the same motions of the little finger, and the interossei are abductors and adductors of the several fingers. The lumbricales are accessory in their actions to the deep flexors: they were called by the earlier anatomists, ***fiducinæ; i. e.*** fiddler's muscles, from an idea that they might effect the fractional movements by which the performer is enabled to produce the various notes on that instrument.

In relation to the axis of the hand, the four dorsal interossei are ***abductors***, and the three palmar, ***adductors***. It will therefore be seen that each finger is provided with its proper adductor and abductor, two flexors and (with the exception of the middle and ring fingers) two extensors. The thumb has moreover a flexor and extensor of the metacarpal bone; and the little finger a flexor of the metacarpal bone without an extensor.

MUSCLES OF THE LOWER EXTREMITY.

Dissection (for plate 47).—The subject being turned on its face, and a block placed beneath the pubis to support the pelvis, the student commences the dissection of this region, by carrying an incision from the apex of the coccyx along the crest of the ileum to its anterior superior spinous process; or ***vice versa*** if he be on the left side.

He then makes an incision from the posterior fifth of the crest of the ileum, to the apex of the trochanter major—this marks the upper border of the gluteous maximus; and a third incision from the apex of the coccyx along the fleshy margin of the lower border of the gluteus maximus, to the outer side of the thigh, about four inches below the apex of the trochanter major. He then reflects the integument, superficial fascia, and deep fascia, which latter is very thin over this muscle, from the gluteus maximus, following rigidly the course of its fibres; and having exposed the muscle in its entire extent, he dissects the integument and superficial fascia from off the deep fascia which binds down the gluteus medius—the other portion of this region.

The gluteus maximus must be turned down from its origin, in order to bring the next muscles into view.

The gluteus medius should now be removed from its origin and turned down, so as to expose the next which is situated beneath it.

In this region the tendon only of the obturator extenus can be seen, situated deeply between the gemellus inferior and the upper border of the quadratus femoris. To expose this muscle fully, it is necessary to dissect it from the anterior part of the thigh, after the removal of the pectineus and adductor longus and brevis muscles.

Actions.—The glutei muscles are abductors of the thigh, when they take their fixed point from the pelvis. Taking their fixed point from the thigh, they steady the pelvis on the head of the femur—this action is peculiarly obvious in standing on one leg; they assist also in carrying the leg forward, in progression. The gluteus minimus being attached to the anterior border of the trochanter major, rotates the limb slightly inwards. The gluteus medius and maximus, from their insertion into the posterior aspect of the bone, rotate the limb out-

PLATE 47.*

* *The Deep Muscles of the Gluteal Region.*—1. The external surface of the ilium. 2. The posterior surface of the sacrum. 3, The posterior sacro-iliac ligaments. 4. The tuberosity of the ischium. 5. The great or posterior sacro-ischiatic ligament. 6. The lesser or anterior sacro-ischiatic ligament. 7. The trochanter major. 8. The gluteus minimus. 9. The pyriformis. 10. The gemellus superior. 11. The obturator internus muscle, passing out of the lesser sacro-ischiatic foramen. 12. The gemellus inferior. 13. The quadratus femoris. 14. The upper part of the adductor magnus. 15. The vastus externus. 16. The biceps. 17. The gracilis. 18. The semi-tendinosus.

wards; the latter is, moreover, a tensor of the fascia of the thigh. The other muscles rotate the limb outwards, everting the knee and foot; hence they are named external rotators.

Dissection (for plate 48).—Make an incision along the line of Poupart's ligament, from the anterior superior spinous process of the ileum to the spine of the pubis; and a second, from the middle of the preceding down the inner side of the thigh, and across the inner condyle of the femur, to the head of the tibia, where it may be bounded by a transverse incision. Turn back the integument from the whole of this region, and examine the superficial fascia, which is next to be removed in the same manner. After the deep fascia has been well considered, it is likewise to be removed, by dissecting it off in the course of the fibres of the muscles. As it might not be convenient to the junior student to expose so large a surface at once as ordered in this dissection, the vertical incision may be crossed by one or two transverse incisions, as may be deemed most proper.

The rectus must now be divided through its middle, and the two ends turned aside, to bring clearly into view the next muscles.

The muscles of the internal femoral region are exposed by the removal of the inner flap of integument recommended in the dissection of the anterior femoral region. The iliacus and psoas arising from within the abdomen can only be seen in their entire extent after the removal of the viscera from that cavity.

The pectineus must be divided near its origin and turned outwards, and the adductor longus through its middle, turning its ends to either side, to bring into view the adductor brevis.

The adductor brevis may now be divided from its origin and turned outwards, or its inner two thirds may be cut away entirely, when the adductor magnus muscle will be exposed in its entire extent.

Actions.—The tensor vagina femoris renders the fascia lata tense, and slightly inverts the limb. The sartorius flexes the leg upon the thigh; and, continuing to act, the thigh upon the pelvis, at the same time carrying the leg across that of the opposite side, into the position in which tailors sit; hence its name. Taking its fixed point from below, it assists the extensor muscles in steadying the leg, for the support of the trunk. The other four muscles have been collectively named *quadriceps extensor*, from their similarity of action. They extend the leg upon the thigh, and obtain a great increase of power by their attachment to the patella, which acts as a fulcrum. Taking their fixed point from the tibia, they steady the femur upon the leg and the rectus, by being attached to the pelvis, serves to balance the trunk upon the lower extremity.

The iliacus, psoas, pectineus, and adductor longus muscles, bend the thigh upon the pelvis, and, at the same time, from the obliquity of their insertion into the lesser trochanter and linea aspera, rotate the entire limb outwards: the pectineus and adductors adduct the thigh powerfully; and, from the

PLATE 48.*

PLATE 49.†

* *The Muscles of the Anterior Femoral Region.*—1. The crest of the ilium. 2. Its anterior superior spinous process. 3. The gluteus medius. 4. The tensor vaginæ femoris; its insertion into the fascia lata is shown inferiorly. 5. The sartorius. 6. The rectus. 7. The vastus externus. 8. The vastus internus. 9. The patella. 10. The iliacus internus. 11. The psoas magnus. 12. The pectineus. 13. The adductor longus. 14. Part of the abductor magnus. 15. The gracilis.

† *The Muscles of the Posterior Femoral and Gluteal Region.*—1. The gluteus medius. 2. The gluteus maximus. 3. The vastus externus covered in by fascia lata. 4. The long head of the biceps. 5. Its short head. 6. The semi-tendinosus. 7. Semi-membranosus. 8. The gracilis. 9. A part of the inner border of the adductor magnus. 10. The edge of the sartorius. 11. The popliteal space. 12. The gastrocnemius muscle; its two heads. The tendon of the biceps forms the outer hamstring; and the sartorius, with the tendons of the gracilis, semi-tendinosus, and semi-membranosus, the inner hamstring.

manner of the insertion into the linea aspera, they assist in rotating the limb outwards. The gracilis is likewise an adductor of the thigh; but contributes also to the flexion of the leg, by its attachment to the inner tuberosity of the tibia.

Dissection (for plate 49).—Remove the integument and fascia on the posterior part of the thigh by two flaps, as on the anterior region, and turn aside the gluteus maximus from the upper part; the muscles may then be examined.

The biceps, and semi-tendinosus muscles, must be dissected from the tuberosity of the ischium, to bring into view the origin of the semi-membranosus.

The tendons of the semi-tendinosus and semi-membranosus, with those of the gracilis and sartorius, form the inner hamstring.

If the semi-membranosus muscle be turned down from its origin, the student will bring into view the broad and radiated expanse of the adductor magnus, upon which the three flexor muscles above described rest.

Actions.—These three hamstring muscles are the direct flexors of the leg upon the thigh; and, by taking their origin from below, they balance the pelvis on the lower extremities. The biceps, from the obliquity of its direction, everts the leg when partly flexed, and the semi-tendinosus turns the leg inwards, when in the same state of flexion.

Dissection (for plate 50.)—The dissection of the anterior tibial region is to be commenced by carrying an incision along the middle of the leg, midway between the tibia and the fibula, from the knee to the ankle, and bounding it inferiorly by a transverse incision, extending from one malleolus to the other. And to expose the tendons on the dorsum of the foot, the longitudinal incision may be carried onwards to the outer side of the base of the great toe, and be terminated by another incision directed across the heads of the metatarsal bones.

Actions.—The tibialis anticus and peroneus tertius are direct flexors of the tarsus upon the leg; acting in conjunction with the tibialis posticus they direct the foot inwards, and with the peroneus longus and brevis outwards. They assist also in preserving the flatness of the foot during progression. The extensor longus digitorum, and extensor proprius pollicis, are direct extensors of the phalanges; but continuing their action, they assist the tibialis anticus and peroneus tertius, in flexing the entire foot upon the leg. Taking their origin from below, they increase the stability of the ankle joint.

Dissection (for plate 51).—Make an incision from the middle of the popliteal space down the middle of the posterior part

of the leg to the heel, bounding it inferiorly by a transverse incision passing between the two malleoli. Turn aside the flaps of integument and remove the fasciæ from the whole of this region; the gastrocnemius muscle will then be exposed.

Actions.—The three muscles of the calf draw powerfully on the os calcis, and lift the heel; continuing their action, they raise

PLATE 50.*

PLATE 51.†

* *The Muscles of the Anterior Tibial Region.*—1. The extensor muscles inserted into the patella. 2. The subcutaneous surface of the tibia. 3. The tibialis anticus. 4. The extensor communis digitorum. 5. The extensor proprius pollicis. 6. The peroneus tertius. 7. The peroneus longus. 8. The peroneus brevis. 9, 9. The borders of the soleus muscle. 10. A part of the inner belly of the gastrocnemius. 11. The extensor brevis digitorum; the tendon in front of this number is that of the peroneus tertius; and that behind it, the tendon of the peroneus brevis.

† *The Superficial Muscles of the Posterior Aspect of the Leg.*—1. The biceps muscle forming the outer hamstring. 2. The tendons forming the inner hamstring. 3. the popliteal space. 4. The gastrocnemius muscle. 5, 5. The soleus. 6. The tendo Achillis. 7. The os calcis. 8. The tendons of the peroneus longus and brevis muscles, passing behind the outer ankle. 9. The tendons of the deep layer, passing into the foot behind the inner ankle.

the entire body. This action is attained by means of a lever of the second power, the fulcrum (the toes) being at one end, the weight (the body supported on the tibia) in the middle, and the power (these muscles) at the other extremity.

They are, therefore, the walking muscles, and perform all movements that require the support of the whole body from the ground, as dancing, leaping, &c. Taking their fixed point from below, they steady the leg upon the foot.

Dissection (for plate 52).—After the removal of the soleus the deep layer will be found bound down by an intermuscular fascia, which being dissected away the muscles may be examined.

PLATE 52.*

The flexor longus pollicis must now be removed from its origin, and the flexor longus digitorum drawn aside, to bring into view the entire extent of the tibialis posticus.

The student will observe that the two latter muscles change their relative position to each other in their course. Thus, in the leg, the position of the three muscles from within outwards, is flexor longus digitorum, tibialis posticus, flexor longus pollicis. At the inner malleolus, the relation of the tendons is tibialis posticus, flexor longus digitorum, both in the same sheath; then a broad groove, which lodges the posterior tibial artery, venæ comites, and nerve; and lastly, the flexor longus pollicis.

Actions.—The popliteus is a flexor of the tibia upon the thigh, carrying it at the same time inwards, so as to invert the leg. The flexor longus pollicis, and flexor longus digitorum are the long flexors of the toes; their tendons are connected in the foot by a short tendinous band, hence they necessarily act together. The tibialis posticus is an extensor of the tarsus upon the leg, and an antagonist to the tibialis anticus. It combines with the tibialis anticus in adduction of the foot.

* *The Deep Layer of Muscles of the Posterior Tibial Region.*—1. The lower extremity of the femur. 2. The ligamentum posticum Winslowii. 3. The tendon of the semi-membranous muscle, dividing into its three slips. 4. The internal lateral ligament of the knee joint. 5. The external lateral ligament. 6. The popliteus muscle. 7. The flexor longus digitorum. 8. The tibialis posticus. 9. The flexor longus pollicis. 10. The peroneus longus muscle. 11. The peroneus brevis. 12. The tendo Achillis, divided at its insertion into the os calcis. 13. The tendons of the tibialis posticus and flexor longus digitorum muscles, just as they are about to pass beneath the internal annular ligament of the ankle; the interval between the latter tendon and the tendon of the flexor longus pollicis is occupied by the posterior tibial vessels and nerve.

PLATE 53.*

PLATE 54.†

Dissection (for plate 53). The sole of the foot is best dissected by an incision around the heel, and along the inner and outer borders of the foot, to the great and little toes. This incision should divide the integument and superficial fascia, and both together should be dissected from the deep fascia, as far forward as the base of the phalanges, where they may be removed from the foot altogether. The deep fascia should then be removed, and the first layer of muscles will be brought into view.

The three preceding muscles (3, 4 and 5, on plate,) must be divided from their origin, and anteriorly through their tendons, and removed, in order to bring into view the second layer.

Dissecton (for plate 54).—The tendons of the long flexors and the muscles connected with them must be removed, to see clearly the attachments of the third layer.

Actions.—All the preceding muscles act upon the toes; and the movements which they are capable of executing, may be referred to four heads, viz., flexion, extension, adduction, and abduction.

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* *First Layer of Muscles in the Sole of the Foot.*—This layer is exposed by the removal of the plantar fascia. 1. The os calcis. 2. The posterior part of the plantar fascia, divided transversely. 3. The abductor pollicis. 4. The abductor minimi digiti. 5. The flexor brevis digitorum. 6. The tendon of the flexor longus pollicis muscle. 7, 7. The lumbricales. On the second and third toes, the tendons of the flexor longus digitorum are seen passing through the bifurcation of the tendons of the flexor brevis digitorum.

† *The Third and a part of the Second Layer of Muscles of the Sole of the Foot.*—1. The divided edge of the plantar fascia. 2. The musculur accessorius. 3. The tendon of the flexor longus digitorum, previously to its division. 4. The tendon of the flexor longus pollicis. 5. The flexor brevis pollicis. 6. The adductor pollicis. 7. The flexor brevis minimi digiti. 8. The transversus pedis. 9. Interossei muscles, plantar and dorsal. 10. A convex ridge, formed by the tendon of the peroneus longus muscle in its oblique course across the foot.

ON THE FASCIÆ.

FASCIA (fascia a bandage) is the name assigned to laminæ of various extent and thickness, which are distributed through the different regions of the body, for the purpose of investing or protecting the softer and more delicate organs. From a consideration of their structure, these fasciæ may be arranged into three classes:—cellular fasciæ, cellulo-fibrous fasciæ and tendino-fibrous fasciæ.

The *cellular fascia* is best illustrated in the common subcutaneous investment of the entire body, the superficial fascia. This structure is situated immediatly beneath the integument over every part of the frame, and is the medium of connection between that layer and the deeper parts. It is composed of cellular tissue containing in its areolæ a considerable abundance of adipose vesicles. The fat, being a bad conductor of caloric, serves to retain the warmth of the body; while it forms at the same time a yielding tissue, through which the minute vessels and nerves may pass to the papillary layer of the skin, without incurring the risk of obstruction from injury or pressure upon the surface. By dissection, the superficial fascia may be separated into *two layers*, between which are found the superficial or cutaenous vessels, and nerves; as, the superficial epigastric artery, the saphenous veins, the radial and ulnar veins, the superficial lymphatic vessels, also the cutaneous muscles, as the platysma myoides, orbicularis palpebrarum, sphincter ani, &c. In some situations where the depositions of fat would have been injurious to the functions of the part, the cells of the cellular fascia are moistened by a serous exhalation, analogous to the secretion of serous membranes, as in the eyelids and scrotum.

The *cellulo-fibrous fascia* appears to result from a simple condensation of cellular tissue deprived of its fat, and intermingled with strong fibres disposed in various directions, so as to constitute an inelastic membrane of considerable strength. Of this structure is the deep fascia of the neck, some of the fasciæ of the cavities of the trunk, as the thoracic and transversalis fasciæ, and the sheaths of vessels.

The *tendino-fibrous fascia* is the strongest of the three kinds of investing membrane; it is composed of strong tendinous fibres, running parallel with each other, and connected by other fibres of the same kind passing in different directions. When freshly exposed, it is brilliant and nacreous, and is tough, inelastic, and unyielding. In the limbs it forms the deep fascia, enclosing and forming distinct sheaths to all the muscles and tendons. It is thick upon the outer and least protected side of the limb, and thinner upon its inner side. It is firmly connected to the bones and to the prominent points of each region, as to the pelvis, knee, and ankle, in the lower, and to the clavicle,

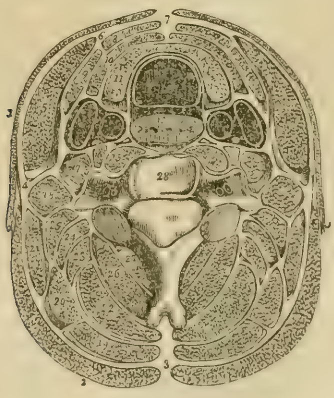
scapula, elbow, and wrist in the upper extremity. It assists the muscles in their action, by keeping up a tonic pressure on their surface; and aids materially in the circulation of the fluids in opposition to the laws of gravity; and in the palm of the hand and sole of the foot is a powerful protection to the structures of which these organs are composed. In some situations its tension is regulated by muscular action, as by the tensor vaginæ femoris and gluteus maximus in the thigh, and by the biceps and palmaris longus in the arm; and in other situations it affords an extensive surface for the origin of the fibres of muscles.

The fasciæ may be arranged like the other textures of the body into—1. Those of the head and neck. 2. Those of the trunk. 3. Those of the upper extremity. 4. Those of the lower extremity.

FASCIÆ OF THE HEAD AND NECK.

The *temporal fascia* is a strong tendino-fibrous membrane which covers in the temporal muscle at each side of the head, and gives origin by its internal surface to the superior muscular fibres.

PLATE 55.*



* *A Transverse Section of the Neck*—showing the deep cervical fascia and its numerous prolongations, forming sheaths for the different muscles. As the figure is symmetrical, the figures of reference are placed only on one side. —1. The platisma myoides. 2. The trapezius. 3. The ligamentum nuchæ, from which the fascia may be traced forwards beneath the trapezius, enclosing the other muscles of the neck. 4. The point at which the fascia divides, to form a sheath for the sterno-mastoid muscle (5). 6. The point of reunion of the two layers of the sterno mastoid sheath. 7. The point of union of the deep cervical fascia of opposite sides of the neck. 8. Section of the sterno-

The *superficial cervical fascia* contains between its layers the platysma myoides muscle.

The *deep cervical fascia* is a strong cellulo-fibrous layer which invests the muscles of the neck, and retains and supports the vessels and nerves.

FASCIÆ OF THE TRUNK.

The *thoracic fascia* is a dense layer of cellulo-fibrous membrane stretched horizontally across the superior opening of the thorax. It is firmly attached to the concave margin of the first rib, and to the inner surface of the sternum.

The thoracic fascia performs three important offices, viz.

1. It forms the upper boundary of the chest, as the diaphragm does the lower.

2. It steadily preserves the relative situation of the parts which enter and quit the thoracic opening.

3. It attaches and supports the heart in its situation, through the medium of its connection with the aorta and large vessels which are placed at its curvature.

ABDOMINAL FASCIÆ.

The lower part of the parietes of the abdomen, and the cavity of the pelvis, are strengthened by a layer of fascia which lines their internal surface, and at the bottom of the latter cavity is reflected inwards to the sides of the bladder. This fascia is continuous throughout the whole of the surface.

The *fascia transversalis* is a cellulo-fibrous lamella, which lines the inner surface of the transversalis muscle.

The internal abdominal ring is situated in this fascia, at about midway between the spine of the pubis, and the anterior superior spine of the ilium, and half an inch above Poupart's ligament; it is bounded upon its inner side by a well-marked falciform border, but is ill defined around its outer margin. From the circumference of this ring is given off an infundibiliform process which surrounds the testicle and spermatic cord, constituting the fascia propria of the latter, and forms the first investment to the sac of oblique inguinal hernia. It is the strength of this fascia, in the interval between the edge of the

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hyoid. 9. Omo-hyoid. 10. Sterno-thyroid. 11. The lateral lobe of the thyroid gland. 12. The trachea. 13. The œsophagus. 14. The sheath containing the common carotid artery, internal jugular vein, and pneumogastric nerve. 15. The longus colli. The nerve in front of the sheath of this muscle is the sympathetic. 16. The rectus anticus major. 17. Scalenus anticus. 18. Scalenus posticus. 19. The splenius capitis. 20. Splenius colli. 21. Levator anguli scapulæ. 22. Complexus. 23. Trachelo-mastoid. 24. Transversalis colli. 25. Cervicalis ascendens. 26. The semi-spinalis colli. 27. The multifidus spinæ. 28. A cervical vertebra. The transverse processes are seen to be traversed by the vertebral artery and vein.

rectus and the internal abdominal ring, that defends this portion of the parietes from the frequent occurrence of direct inguinal hernia.

INGUINAL HERNIA.

Inguinal hernia is of two kinds, oblique, and direct.

In *oblique inguinal hernia*, the intestine escapes from the cavity of the abdomen into the spermatic canal, through the *internal abdominal ring*, pressing before it a pouch of peritoneum which constitutes the *hernial sac*, and distending the infundibiliform process of the transversalis fascia. After emerging through the internal abdominal ring, it passes *first* beneath the lower and arched border of the transversalis muscle; *then* beneath the lower border of the internal oblique muscle; and *finally*, through the external abdominal ring in the aponeurosis of the external oblique. From the transversalis muscle it receives no investment; while passing beneath the lower border of the internal oblique, it obtains the cremaster muscle; and, upon escaping at the external abdominal ring, receives the intercolumnar fascia.

The spermatic canal, which, in the normal condition of the abdominal parietes serves for the passage of the spermatic cord in the male, and the round ligament with its vessels in the female, is about one inch and a half in length. It is bounded *in front* by the aponeurosis of the external oblique muscle; *behind*, by the transversalis fascia, and by the conjoined tendon of the internal oblique and transversalis muscle; *above*, by the arched borders of the internal oblique and transversalis; *below*, by the grooved border of Poupart's ligament; and at each extremity, by one of the abdominal rings, the internal ring at the inner termination, the external ring at the outer extremity.

There are three varieties of oblique inguinal hernia—common, congenital, and encysted.

Common oblique hernia, is that which has been described above.

Congenital hernia results from the nonclosure of the pouch of peritoneum carried downwards into the scrotum by the testicle, during its descent in the fœtus.

The intestine at some period of life is forced into this canal, and descends through it into the tunica vaginalis, where it lies in contact with the testicle; so that congenital hernia has no proper sac, but is contained within the tunica vaginalis. The other coverings are the same as those of common inguinal hernia.

Encysted hernia is that form of protrusion in which the pouch of peritoneum forming the tunica vaginalis, being only partially closed, and remaining open externally to the abdomen,

admits of the hernia passing into the scrotum, behind the tunica vaginalis.

Direct inguinal hernia has receiveid its name from passing *directly* through the external abdominal ring, and forcing before it the opposing parietes.

Direct inguinal hernia differs from oblique in never attaining the same bulk.

All the forms of inguinal hernia are designated *scrotal*, when they have descended into that cavity.

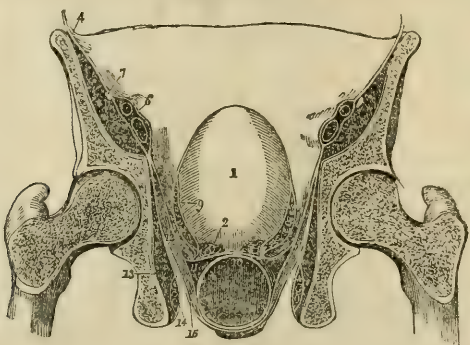
The *fascia iliaca* is the tendino-fibrous investment of the psoas and iliacus muscles; and, like the fascia transversalis, is thick below, and becomes gradually thinner as it ascends.

The *fascia pelvica* is attached to the inner surface of the pubis and along the margin of the brim of the pelvis, where it is continuous with the iliac fascia. From this extensive origin it descends into the pelvis and divides into two layers-the pelvic and obturator.

In the perineum there are two fasciæ of much importance, the superficial and deep perineal fascia.

The *superficial perineal fascia* is a thin tendino-fibrous lay-

PLATE 56*.



* *A transverse Section of the Pelvis*—showing the distribution of the pelvic fascia.—1. The bladder 2. The vesiculæ seminales, divided across. 3. The rectum. 4. The iliac fascia covering in the iliacus and psoas muscles (5), and forming a sheath for the external iliac vessels, 6. 7. The anteriorcrural nerve excluded from the sheath. 8. The pelvic fascia. 9. Its ascending layer, forming the lateral ligament of the bladder of one side, and a sheath to the vesical plexus of veins. 10. The recto-vesical fascia of Mr. Tyrrell, formed by the middle layer. 11. The inferior layer, surrounding the rectum and meeting at the middle line with the fascia of the opposite side. 12. The levator ani muscle. 13. The obturator internus muscle, covered in by the obturator fascia, which also forms a sheath for the internal pudic vessels and nerve, 14. 15. The layer of fascia which invests the under surface of the levator ani muscle, the anal fascia.

er, which covers the muscles of the genital portion of the perineum and the root of the penis.

The *deep perinial fascia* (Camper's ligament, triangular ligament,) is situated behind the root of the penis, and is firmly stretched across between the ramus of the pubis and ischium of each side, so as to constitute a strong septum of defence to the outlet of the pelvis.

FASCIÆ OF THE UPPER EXTREMITY.

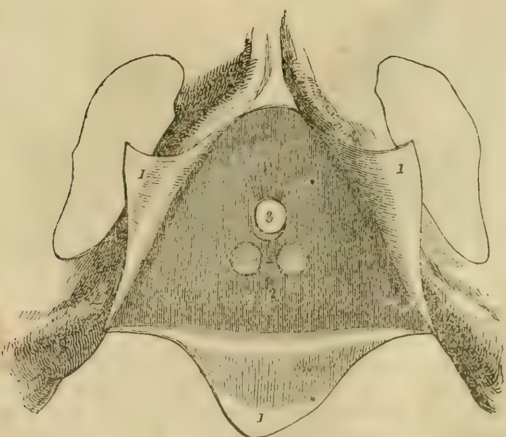
The *superficial fascia* of the upper extremity contains between its layers the superficial veins and lymphatics, and the superficial nerves.

The *deep fascia* is thin over the deltoid and pectoralis major muscles, and in the axillary space, but thick upon the dorsum of the scapula, where it binds down the infra-spinatus muscle. It is attached to the clavicle, acromion process and spine of the scapula.

The tendons, as they pass beneath the annular ligaments, are surrounded by synovial bursæ. The dorsum of the hand is invested by a thin fascia, which is continuous with the posterior annular ligament.

The *palmar fascia* is divided into three portions. A cen-

PLATE 57.*



* *The Pubic Arch, with the Attachments of the Perineal Fasciæ.*—1, 1, 1. The superficial perineal fascia divided by a ⋏ shaped incision into three flaps; the lateral flaps are turned over the ramus of the pubis and the ischium at each side, to which they are firmly attached; the posterior flap is continuous with the deep perineal fascia. 2. The deep perineal fascia. 3. The opening for the passage of the membranous portion of the urethra, previously to entering the bulb. 4. Two projections of the anterior layer of the deep perineal facia, corresponding with Cowper's glands.

tral portion, which occupies the middle of the palm, and two lateral portions, which spread out over the sides of the hand, and are continuous with the dorsal fascia.

FASCIÆ OF THE LOWER EXTREMITY.

The *superficial fascia* contains between its two layers the superficial vessels and nerves of the lower extremity. At the groin these two layers are separated from each other by the superficial lymphatic glands and the deeper layer is attached to Poupart's ligament, while the superficial layer is continued into the superficial fascia of the abdomen.

The *deep fascia* of the thigh is named, from its great extent,

PLATE 58.*

* *A Side View of the Viscera of the Pelvis*—showing the distribution of the perineal and pelvic fasciæ.—1. The symphysis pubis. 2. The bladder. 3. The recto-vesical fold of peritoneum, passing from the anterior surface of the rectum to the posterior part of the bladder; from the upper part of the fundus of the bladder it is reflected upon the abdominal parietes. 4. The ureter. 5. The vas deferens crossing the direction of the ureter. 6. The vesicula seminalis of the right side. 7, 7. The prostrate gland divided by a longitudinal section. 8, 8. The section of a ring of elastic tissue encircling the prostatic portion of the urethra at its commencement. 9. The prostatic portion of the urethra. 10. The membranous portion, enclosed by the compressor urethræ muscle. 11. The commencement of the corpus spongiosum penis, the bulb. 12. The anterior ligaments of the bladder, formed by the reflection of the pelvic fascia, from the internal surface of the os pubis to the neck of the bladder. 13. The edge of the pelvic fascia at the point where it is reflected upon the rectum. 14. An interval between the pelvic fascia and the deep perineal fascia, occupied by a plexus of veins. 15. The deep perineal fascia; its two layers. 16. Cowper's gland of the right side, situated between the two layers below the membranous portion of the urethra. 17. The superficial perineal fascia ascending in front of the root of the penis to become continuous with the dartos of the scrotum (18). 19. The layer of the deep fascia, which is prolonged to the rectum. 20. The lower part of the levator ani; its fibres are concealed by the anal fascia. 21. The inferior segment of the funnel-shaped process given off from the posterior layer of the deep perineal fascia, which is continuous with the recto-vesical fascia of Tyrrell. The attachment of this fascia to the recto-vesical fold of peritoneum is seen at 22.

tha *fascia lata ;* it is thick and strong upon the outer side of the limb, and thinner upon its inner and posterior side.

The *iliac portion* of the upper fascia lata, is situated upon the iliac side of the sapheonus opening. It is attached to the crest of the ilium and along Poupart's ligament, to the spine of the pubis, from which point it is reflected downwards and outwards, and forms a falciform border, which constitutes the outer boundary of the saphenous opening. The edge of this border immediately overlays and is reflected upon the sheath of the femoral vessels, and the lower extremity of the curve is continuous with the pubic portion.

The *pubic portion* is attached to the spine of the pubis and pectineal line, and passing outwards behind the sheath of the femoral vessels divides into two layers; the anterior layer is continuous with that portion of the iliac fascia which forms the sheath of the iliacus and psoas muscles, and the posterior layer is lost upon the capsule of the hip joint.

PLATE 59.*

* *A Section of the Structures which pass beneath the Femoral Arch.* 1. Poupart's ligament. 2, 2. The iliac portion of the fascia lata, attached along the margin of the crest of the ilium, and along Poupart's ligament, to the spine of the pubis (3). 4. The pubic portion of the fascia lata, continuous at 3 with the iliac portion, and passing outwards behind the sheath of the femoral vessels to its outer border at 5, where it divides into two layers; one is continuous with the sheath of the psoas (6) and iliacus (7), and the other (8) is lost upon the capsule of the hip joint (9). 10. The femoral nerve, enclosed in the sheath of the psoas and iliacus. 11. Gimbernat's ligament. 12. The femoral ring, within the femoral sheath. 13. The femoral vein. 14. The femoral artery. The two vessels and the ring are surrounded by the femoral sheath, and their septa are sent between the anterior and posterior walls of the sheath, dividing the artery from the vein, and the vein from the femoral ring.

ON THE ARTERIES.

The *arteries* are the cylindrical tubes which convey the blood from the ventricles of the heart to every part of the body. They are dense in structure, and preserve for the most part the cylindrical form when emptied of their blood, which is their condition after death: hence they were considered by the ancients, as the vessels for the transmission of the vital spirits, and were therefore named *arteries*.

The artery proceeding from the left ventricle of the heart contains the pure or arterial blood, which is distributed throughout the entire system, and constitutes with its returning veins, the *greater* or *systemic circulation*. That which emanates from the right ventricle, conveys the impure blood to the lungs; and with its corresponding veins establishes the *lesser* or *pulmonary circulation*.

The whole of the arteries of the systemic circulation proceed from a single trunk, named the *aorta*, from which they are given off as branches, and divide and subdivide to their ultimate ramifications, constituting the great arterial tree which pervades by its minute subdivisions, every part of the animal frame. The mode in which the division into branches takes place is deserving of remark. From the aorta the branches for the most part pass off at right angles, as if for the purpose of checking the impetus, with which the blood would otherwise rush along their cylinders from the main trunk; but, in the limbs a very different arrangement is adopted; the branches are given off from the principal artery at an acute angle, so that no impediment may be offered to the free circulation of the vital fluid. The division of arteries is usually dichotomous, as of the aorta into the two common iliacs, common carotid into the external and internal, &c.; but in some few instances a short trunk divides suddenly into several branches which proceed in different directions; this mode of division is termed an *axis*, as the thyroid and cœliac axis.

The arteries do not terminate directly in veins; but in an intermediate system of vessels, which from their minute size, are termed *capillaries*. The capillaries constitute a microscopic network, which is distributed through every part of the body, so as to render it impossible to introduce the smallest needle point beneath the skin without wounding several of these fine vessels. It is through the medium of the capillaries, that all the phenomena of nutrition and secretion are performed. They are remarkable for their uniformity of diameter, and for the constant divisions and communications which take place between them without any alteration of size. They inosculate on one hand with the terminal ramusculi of the arteries; and on the other with the minute radicles of the veins.

Arteries are composed of three coats, external, middle, and internal. The *external* or *cellular coat* is firm and strong, and serves at the same time as the chief means of resistance of the vessel, and of connection to surrounding parts. It consists of condensed cellular tissue, strengthened by an interlacement of glistening fibres which partially encircle the cylinder of the tube in an oblique direction. Upon the surface the cellular tissue is loose, to permit of the movements of the artery in distension and contraction.

The *middle* or *fibrous coat* is composed of yellowish fibres of elastic tissue, which are disposed in an oblique direction around the cylinder of the vessel, and cross each other in their course. This coat is elastic and fragile, and thicker than the external coat. Its elasticity enables the vessel to accommodate itself to the quantity of blood which it may contain; and its fragility is exhibited in some cases of aneurism, and in the division of the two internal coats in ligature of an artery.

The *internal coat* is a thin serous membrane which lines the interior of the artery, and gives it the smooth polish which that surface presents. It is continuous with the lining membrane of the heart, and through the medium of the capillaries with the venous system. The internal is connected to the fibrous coat by a close cellular tissue which is very liable to disease and depositions of various kinds; and is the seat of the first changes which precede aneurism. The researches of Henle have demonstrated an epithelium, composed of vesicles and scales, with central nuclei, upon the surface of this internal coat, analagous to the epithelium of serous and mucous membranes.

The arteries in their distribution through the body are included in a loose cellular investment which separates them from the surrounding tissues, and is called a *sheath*. Around the principal vessels the sheath is an important structure; it is composed of cellulo-fibrous tissue, intermingled with tendinous fibers, and is continuous with the fasciæ of the region in which the arteries are situated, as with the thoracic and cervical fasciæ in the neck, transversalis and iliac fasciæ, and fascia lata in the thigh, &c. The sheath of the arteries contains also their accompanying veins, and sometimes a nerve.

The coats of arteries are supplied with blood like other organs of the body, and the vessels which are distributed to them are named *vasa vasorum*. They are also provided with nerves; but the mode of distribution of these nerves is at present undiscovered.

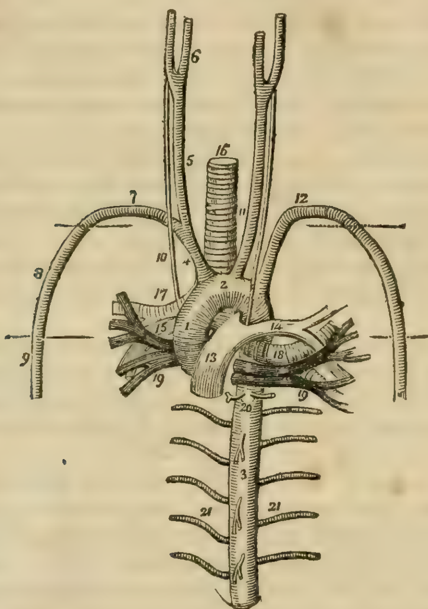
In the consideration of the arteries, we shall first describe the aorta, and the branches of that trunk, with their subdivisions, which together constitute the efferent portion of the systemic

circulation, and then the pulmonary artery as the efferent trunk of the pulmonary circulation.

AORTA.

The *aorta* arises from the left ventricle, at the middle of the root of the heart, opposite the articulation of the fourth costal cartilage with the sternum. It ascends at first to the right, then curves backwards and to the left, and descends on the left side of the vertebral column to the fourth lumbar vertebra. Hence it is divided into—ascending arch—and descending aorta.

PLATE 60.*



* *The Large Vessels which proceed from the root of the heart, with their Relations.*—The heart has been removed. 1. The ascending aorta. 2. The arch. 3. The thoracic portion of the descending aorta. 4. The arteria innominata dividing into 5, the right carotid, which again divides at 6, into the external and internal carotids; and 7, the right subclavian artery. 8. The axillary artery; its extent is designated by a dotted line. 9. The brachial artery. 10. The right pneumogastric nerve, running by the side of the common carotid, in front of the right subclavian artery, and behind the root of the right lung. 11. The left common carotid, having to its outer side the left pneumogastric nerve, which crosses the arch of the aorta, and as it reaches its lower border is seen to give off the left recurrent nerve. 12. The left subclavian artery becoming axillary, and brachial in its course, like the artery of the opposite side. 13. The trunk of the pulmonary artery connected to the concavity of the arch of the aorta by a fibrous cord, the remains of the ductus arteriosus. 14. The left pulmonary artery. 15. The right pulmonary artery. 16.

Relations.—The *ascending* aorta has in relation with it, in front, the trunk of the pulmonary artery, thoracic fascia, and pericardium; behind, the right pulmonary veins and artery; to the right side, the right auricle and superior cava; and to the left, the left auricle and the trunk of the pulmonary artery.

Arch.—The upper border of the arch is parallel with the upper border of the second sterno-costal articulation of the right side in front, and the second dorsal vertebra behind, and terminates opposite the lower border of the third.

The anterior surface of the arch is crossed by the left pneumogastric nerve, and by the cardiac branches of that nerve, and of the sympathetic.

The posterior surface of the arch is in relation with the bifurcation of the trachia and great cardiac plexus, the cardiac nerves, left recurrent nerve, and the thoracic duct.

The superior border gives off the three great arteries, viz. the innominata, left carotid, and left subclavian.

The inferior border, or concavity of the arch, is in relation with the remains of the ductus arteriosus, the cardiac ganglion and the left recurrent nerve, and has passing beneath it, the right pulmonary artery and left bronchus.

The *descending* aorta is subdivided in correspondence with the two great cavities of the trunk, into the thoracic and abdominal aorta.

The *thoracic* aorta is situated to the left side of the vertebral column, but approaches the middle line as it descends, and at the aortic opening of the diaphragm is altogether in front of the column. After entering the abdomen, it again falls back to the left side.

Relations.—It is in relation, behind, with the vertebral column and lesser vena azygos; in front, with the œsophagus and right pneumogastric nerve; to the left side with the pleura, and to the right with the thoracic duct.

The *abdominal* aorta enters the abdomen through the aortic opening of the diaphragm, and descends, lying rather to the left side of the vertebral column, to the fourth lumbar vertebra, where it divides into the two common iliac arteries.

Relations.—It is crossed in front, by the left renal vein, pancreas, transverse duodenum, and mesentery, and is embraced by the aortic plexus; and behind is in relation with the thoracic duct, receptaculum chili, and left lumbar veins.

The trachea. 17. The right bronchus. 18. The left bronchus. 19, 19. The pulmonary veins. 17, 15 and 19, on the right side, and 14, 18 and 19, on the left, constitute the roots of the corresponding lungs, and the relative position of these vessels is carefully preserved. 20. Bronchial arteries. 21, 21. Intercostal arteries; the branches from the front of the aorta above and below the number 3 are pericardiac and œsophageal branches.

On its left side is the left semilunar ganglion and sympathetic nerve; and on the right, the vena cava, right semilunar ganglion, and the commencement of the vena azygos. The *coronary arteries* arise from the aortic sinuses at the commencement of the ascending aorta, immediately above the free margin of the semilunar valves. The *left*, or *anterior* coronary, passes forwards, between the pulmonary artery and left appendix auriculæ, and divides into two branches, one of which winds around the base of the left ventricle in the auriculo-ventricular groove, and inosculates with the right coronary, forming an arterial circle around the base of the heart, while the other passes along the line of union of the two ventricles, upon the anterior aspect of the heart, to its apex, where it anastomoses with the descending branch of the right coronary. It supplies the left auricle and the adjoining sides of both ventricles.

The *right*, or *posterior* coronary, passes forwards, between the root of the pulmonary artery and the right auricle, and winds along the auriculo-ventricular groove, to the posterior median furrow, where it descends upon the posterior aspect of the heart to its apex, and inosculates with the left coronary. It is distributed to the right auricle and to the posterior surface of both ventricles, and sends a large branch along the sharp margin of the right ventricle to the apex of the heart.

ARTERIA INNOMINATA.

The *arteria innominata* (plate 60, No. 4,) is the first artery given off by the arch of the aorta. It is an inch and a half in length, and ascends obliquely to the right sterno-clavicular articulation, where it divides into the right carotid and right subclavian arteries.

Relations.—It is in relation, in front, with the left vena innominata, and the origins of the sterno-thyroid and sterno hyoid muscles. Behind, with the trachea, pneumogastric nerve, and cardiac nerves; externally, with the right vena innominata and pleura; and internally, with the origin of the left carotid.

The arteria innominata occasionally gives off a small branch which ascends along the middle of the trachea to the thyroid gland. This branch has been described as the *middle thyroid artery*, and a knowledge of its existence is extremely important in performing the operation of tracheotomy.

COM MON CAROTID ARTERIES.

The common corotid arteries arise, the *right* from the bifurcation of the arteria innominata opposite the right sterno-clavicular articulation, the *left* from the arch of the aorta. It follows, therefore, that the right carotid is shorter than the left; it is al-

so more anterior; and, in consequence of proceeding from a branch instead of from the main trunk, it is larger than its fellow.

The *right* common carotid artery (plate 60, No. 5,) ascends the neck perpendicularly, from the right sterno-clavicular articulation to a level with the upper border of the thyroid cartilage, where it divides into the external and internal carotid.

The *left* common carotid (pl. 60, No. 11,) passes somewhat obliquely outwards from the arch of the aorta to the side of the neck, and thence upwards to a level with the upper border of the thyroid cartilage, where it divides like the right common carotid into the external and internal carotid.

Relations.—The right common carotid rests, first, upon the longus colli muscle, then upon the rectus anticus major, the sympathetic nerve being interposed. The inferior thyroid artery and recurrent laryngeal nerve pass behind it at its lower part. To its inner side is the trachea, recurrent laryngeal nerve, and larynx; to its outer side, and enclosed in the same sheath, the jugular vein and pneumogastric nerve; and in front, the sterno-thyroid, sterno-hyoid, sterno-mastoid, omo-hyoid and platisma muscles, and the descendens noni nerve. The left common carotid, in addition to the relations just enumerated, which are common to both, is crossed near its commencement by the left vena innominata; it lies upon the trachea; then gets to its side, and is in relation with the œsophagus and thoracic duct.

EXTERNAL CAROTID ARTERY.

The *external* carotid artery ascends perpendicularly from opposite the upper border of the thyroid cartilage, to the space between the neck of the lower jaw and the meatus auditorius.

Relations.—In front it is crossed by the posterior belly of the digastricus, stylo-hyoideus and platysma myoides muscles; by the lingual nerve near its origin; higher up it is situated in the substance of the parotid gland, and is crossed by the facial nerve. Behind, it is separated from the internal carotid by the stylo-pharyngeus and stylo-glossus muscles, glosso-pharyngeal nerve, and part of the parotid gland.

Branches.—The branches of the external carotid are ten in number, and may be arranged into three groups, viz.—*Anterior*, superior thyroid, lingual, fascial; *posterior*, mastoid, occipital, posterior auricular; *superior*, ascending pharyngial, transverse fascial, temporal, internal maxillary.

The *Superior thyroid artery* curves downwards to the thyroid gland to which it is distributed, anastomosing with its fellow of the opposite side, and with the inferior thyroid arteries.

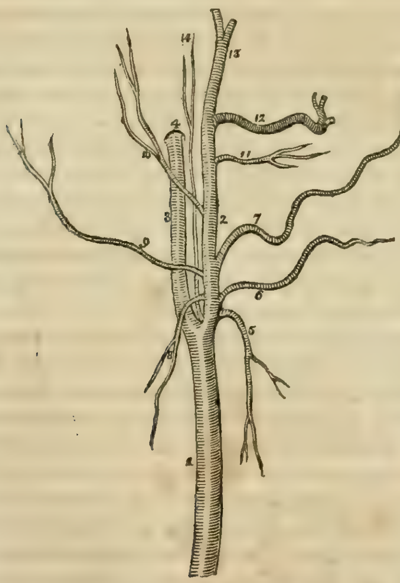
The *Lingual artery* crosses obliquely the great cornu of the

os hyoides; secondly, it passes forwards parallel with the os hyoides; thirdly, it ascends to the under surface of the tongue; and fourthly, runs forward in a serpentine direction to its tip under the name of the *ranine artery.*

Relations.—The first part of its course rests upon the great cornu of the os hyoides, and the origin of the middle constrictor muscle of the pharynx; the second is situated between the middle constrictor and hyo-glossus muscles, the latter separating it from the lingual nerve; in the third part of its course, it lies between the hyo-glossus and genio-hyo glossus; and in the fourth ranine rests upon the lingulis to the tip of the tongue.

Facial artery.—The facial artery ascends obliquely to the submaxillary gland, in which it lies embedded. It then curves around the body of the lower jaw, close to the anterior inferior angle of the masseter muscle, ascends to the angle of the mouth, and thence to the angle of the eye, where it is named the *angular artery.* The facial artery is very tortuous in its course over

PLATE 61.*



* *The Carotid Arteries, with the Branches of the External Carotid.*—1. The common carotid. 2. The external carotid. 3. The internal carotid. 4. The carotid foramen in the petrous portion of the temporal bone. 5. The superior thyroid artery. 6. The lingual artery. 7. The fascial artery. 8. The mastoid artery. 9. The occipital. 10. The posterior auricular. 11. The transverse fascial artery. 12. The internal maxillary. 13. The temporal. 14. The ascending pharyngeal artery.

the buccinator muscle to accommodate itself to the movements of the jaws.

Relations.—Below the jaw it passes beneath the digastricus and stylo-hyoid muscles; on the body of the lower jaw it is covered by the platysma myoides, and at the angle of the mouth by the depressor anguli oris and zygomatic muscles.

The *Mastoid* artery turns downwards, to be distributed to the sterno-mastoid muscle, and the lymphatic glands of the neck; sometimes it is replaced by two small branches.

The *Occipital artery* passes backwards beneath the posterior belly of the digastricus, the trachelo-mastoid, and sterno-mastoid muscles, to the occipital groove in the mastoid portion of the temporal bone. It then ascends between the splenius and complexus muscles, and is distributed upon the occiput, anastomosing with the opposite occipital, the posterior auricular, and temporal arteries. The lingual nerve curves around this artery, near its origin from the external carotid.

The *Posterior auricular artery* arises from the external carotid, above the digastric and stylo-hyoid muscles, and ascends beneath the lower border of the parotid gland, and behind the concha, to be distributed to the external ear and side of the head, anastomosing with the occipital and temporal arteries; some of its branches pass through fissures in the fibro-cartilage, to be distributed to the anterior surface of the pinna. The anterior auricular arteries are branches of the temporal.

The *Ascending pharyngeal artery* arises from the external carotid near to its bifurcation, and ascends between the internal carotid and the side of the pharynx to the base of the skull, where it divides into branches which enter the foramina in that region, to be distributed to the dura mater. It supplies the pharynx, tonsils, and Eustachian tube.

The *Transversalis fascei* arises from the external carotid, whilst that trunk is lodged within the parotid gland; it crosses the masseter muscle, lying parallel with and a little above Stenon's duct; and is distributed to the muscles and integument on the side of the face, inosculating with the infra-orbital and fascial arteries.

The *Temporal artery* is one of the two terminal branches of the external carotid. It ascends over the root of the zygoma; and at about an inch and a half above the zygomatic arch divides into an anterior and a posterior temporal branch. The *anterior* temporal is distributed over the front of the temple and arch of the skull, and anastomoses with the opposite anterior temporal, and with the supra-orbital and frontal arteries. The *posterior* temporal curves upwards and backwards, and inosculates with its fellow of the opposite side, with the posterior auricular and occipital arteries.

The trunk of the temporal artery is covered in by the parotid gland and attrahens aurem muscles, and rests upon the temporal facia.

The *Internal maxillary artery* (pl. 61, No. 12,) is one of the two terminal branches of the external carotid. Commencing in the substance of the parotid gland, opposite the meatus auditorius externus, it passes in the first instance horizontally forwards behind the neck of the lower jaw; it next ascends obliquely between the two pterygoid muscles to the upper part of the tuberosity of the superior maxillary bone; and between the two heads of the external pterygoid muscle bends into the spheno-maxillary fossa. The artery may, therefore, in consideration of its course, be divided into three portions—maxillary, pterygoid, and spheno-maxillary.

Relations.—The *maxillary* portion is situated between the ramus of the jaw and internal lateral ligament, lying parallel with the auricular nerve; the *pterygoid* portion between the two pterygoid muscles, and between the gustatory and dental nerves. The *pterygo-maxillary* portion lies between the two heads of the external pterygoid muscle, and in the spheno-maxillary fossa is in relation with Meckel's ganglion.

When the artery passes externally to the external pterygoid muscle, it lies between that muscle and the temporal, and passes between the two heads of the external pterygoid.

INTERNAL CAROTID ARTERY.

The *Internal* carotid artery curves slightly outwards from the bifurcation of the common carotid, and then ascends nearly perpendicularly to the carotid foramen in the petrous bone. It next passes inwards along the carotid canal, forwards by the side of the sella turcia, and upwards by the anterior clinoid process, where it pierces the dura mater and divides into three terminal branches.

Relations.—In the consideration of its connections, the artery is divisible into cervical, petrous, cavernous and cerebral portions.

The *cervical* portion is in relation posteriorly with the rectus anticus major, sympathetic nerve, pharyngeal and laryngeal nerves, which cross behind it, and near the carotid foramen with the glosso-pharyngeal, pneumogastric and lingual nerves, and partly with the internal jugular vein. Internally, it is in relation with the side of the pharynx, the tonsil, and the ascending pharyngeal artery. Externally, with the internal jugular vein, glosso-pharyngeal, pneumogastric, and lingual nerves; and in front, with the stylo-glossus and stylo-pharyngeus muscles, glosso-pharyngeal nerve, and parotid gland.

The *petrous* portion is in relation with the carotid plexus, and is covered in by the Casserian ganglion.

The *cavernous* portion is situated in the inner wall of the cavernous sinus, and is in relation by its outer side with the lining membrane of the sinus, the sixth nerve, and the ascending branches of the carotid plexus. The third, fourth, and ophthalmic nerves are placed in the outer wall of the cavernous sinus, and are separated from the artery by the lining membrane of the sinus.

The *cerebral* portion of the artery is lodged in the fissure of Sylvius.

SUBCLAVIAN ARTERY.

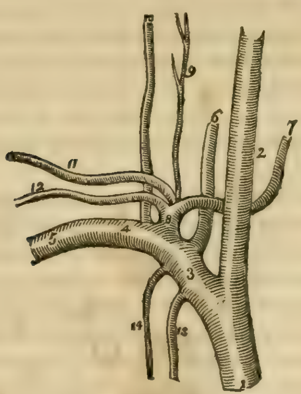
The *Subclavian* artery, on the right side, arises from the arteria innominata, opposite the sterno-clavicular articulation, and on the left from the arch of the aorta.

The course of the subclavian artery is divisible into three portions.

The *first* portion, on the right side, ascends obliquely outwards to the inner border of the scalenus anticus. On the left side it ascends perpendicularly to the inner border of that muscle. The *second* portion curves outwards behind the scalenus anticus; and the *third* portion passes downwards and outwards, beneath the clavicle, to the lower border of the first rib, where it becomes the axillary artery.

Relations.—The first portion, on the right side, is in rela-

PLATE 62.*



* *The Branches of the right Subclavian Artery.*—1. The arteria innominata. 2. The right carotid. 3. The first portion of the subclavian artery. 4. The second portion. 5. The third portion. 6. The vertebral artery. 7. The inferior thyroid. 8. The thyroid axis. 9. The superficialis cervicis. 10. The profunda cervicis. 11 The posterior scapular or transversalis colli. 12. The supra-scapular. 13. The internal mammary artery. 14. The superior intercostal.

tion in front with the internal jugular and subclavian veins, and is crossed by the pneumogastric nerve, cardiac nerves, and phrenic nerve. Behind and beneath it is invested by the pleura, and is crossed by the right recurrent laryngeal nerve and vertebral vein. The first portion on the left side is in relation in front with the pleura, the vena innominata, the pneumogastric and phrenic nerves (which lie parallel to it), and the left carotid artery. To its inner side, is the œsophagus; and behind, the thoracic duct, longus colli, and vertebral column.

Branches.—The branches of the subclavian are given off from the artery before it arrives at the margin of the first rib. The profunda cervicis and superior intercostal frequently encroach upon the second portion, and in varieties of origin a branch or branches may be found proceeding from the third portion.

The primary branches are five in number, the three first being ascending, and the two latter descending. They are—the vertebral, the thyroid axis (inferior thyroid, supra-scapular, posterior scapular, superficialis cervicis), the profunda cervicis, superior intercostal, and internal mammary.

The *Vertebral artery* is the largest of the branches of the subclavian artery; it ascends through the foramina in the transverse processes of all the cervical vertebræ, excepting the last; then winds backwards around the articulating process of the atlas; and piercing the dura mater, enters the skull through the foramen magnum. The two arteries unite at the lower border of the pons Varolii, to form the basilar artery.

The *Basilar artery*, so named from its position at the base of the skull, runs forwards to the upper border of the pons Varolii, where it divides into four ultimate branches, two to either side.

Branches.—The branches of the vertebral and basilar arteries are the following:

Vertebral—lateral spinal, anterior spinal, posterior spinal, posterior meningeal, inferior cerebellar; *basilar*—transverse, superior cerebeller, posterior cerebral.

The *lateral spinal* branches enter the intervertebral foramina, and are distributed to the dura mater of the spinal cord.

The *anterior spinal* is a small branch which unites with its fellow of the opposite side, on the front of the medulla oblongata. The artery formed by the union of these two vessels descends along the anterior aspect of the spinal cord, to which it distributes branches as far as the cauda equina.

The *posterior spinal* winds around the medulla oblongata, to the posterior aspect of the cord, and descends on either side nearly as far as the cauda equina, communicating very freely with the spinal branches of the intercostal and lumbar arteries.

The *posterior meningeal*, often a branch of the inferior cerebellar, is a small branch to the dura mater, lining the inferior occipital fossæ.

The *inferior cerebellar* arteries wind around the upper part of the medulla oblongata to the under surface of the cerebellum, to which they are distributed.

The *transverse* branches of the basilar artery supply the pons Varolii, and adjacent parts of the brain.

The *superior cerebellar* arteries, two of the terminal branches of the basilar, are distributed to the upper surface of the cerebellum, inosculating with the inferior cerebellar. This artery gives off a small branch, which accompanies the seventh pair of nerves into the meatus auditorius internus.

The *posterior cerebral* arteries, the other terminal branches of the basilar, pass off on each side to the posterior lobes of the cerebrum, and communicate on the corpus collosum with the anterior cerebral arteries. They are separated from the superior cerebellar artery, near their origin, by the third pair of nerves, and are in close relation with the fourth pair, in their course around the crura cerebri. Anteriorly, near their origin, they give off a tufft of small vessels, which enter the locus perforatus, and they receive the posterior communicating arteries from the internal carotid.

The Circle of Willis.—The communications established between the anterior cerebral arteries in front, and the internal carotids and posterior cerebral arteries behind, by the communicating arteries, constitute the *Circle of Willis.* This remarkable communication at the base of the brain is formed by the anterior communicating branch, anterior cerebrals, and internal carotid arteries in front, and by the posterior communicating, posterior cerebrals, and basilar artery behind.

The *Thyroid axis* is a short trunk, which divides almost immediately after its origin into four branches, some of which are occasionally branches of the subclavian artery itself.

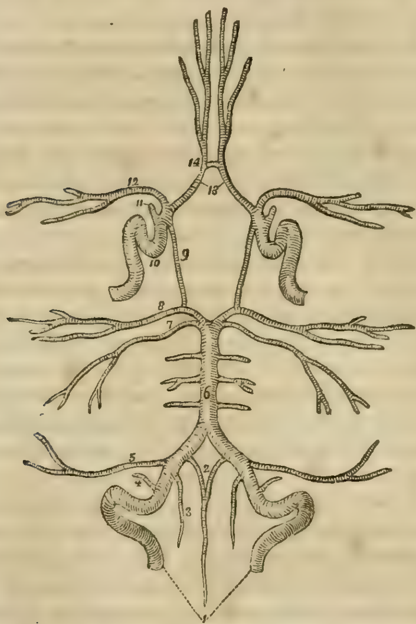
The *Inferior thyroid artery* ascends obliquely behind the sheath of the carotid vessels, to the inferior part of the thyroid gland, to which it is distributed, and sends branches to the trachea, lower part of the larynx, and œsophagus. It is in relation with the middle cervical ganglion of the sympathetic, which rests upon it.

The *Supra-scapular artery* passes obliquely backwards behind the clavicle, and over the ligament of the notch, to the supra-spinatus fossa. It crosses in its course the scalenus anticus muscle, phrenic nerve and subclavian artery, is distributed to the muscles on the dorsum of the scapula, and inosculates with the posterior scapular, and beneath the acromion process with the dorsal branch of the subscapular artery.

The *Posterior scapular artery* passes transversely across the subclavian triangle at the root of the neck, to the superior angle of the scapula. It then descends along the posterior border to its inferior angle, where it inosculates with the subscapular artery, a branch of the axillary. In its course across the neck it passes in front of the scalenus anticus, and across the brachial plexus; in the rest of its course, it is covered in by the trapezius, levator anguli scapulæ, rhomboideus minor, and rhomboideus major muscles. Sometimes it passes behind the scalenus anticus, and between the nerves which constitute the brachial plexus.

The postersor scapular gives branches to the neck, and op-

PLATE 63.*



* *The Circle of Willis.*—The branches of the arteries have references only on one side, on account of their symmetrical distribution. 1. The vertebral arteries. 2. The two anterior spinal branches uniting to form a single vessel. 3. One of the posterior spinal arteries. 4. The posterior meningeal. 5. The inferior cerebellar. 6. The basilar artery giving off its transverse branches to either side. 7. The superior cerebellar artery. 8. The posterior cerebral. 9. The posterior communicating branch of the internal carotid. 10. The internal carotid artery, showing the curvatures it makes within the skull. 11. The ophthalmic artery divided across. 12. The middle cerebral artery. 13. The anterior cerebral arteries, connected by 14. The anterior communicating artery.

posite the angle of the scapula inosculates with the profunda cervicis. It supplies the muscles of the posterior border of the scapula, and establishes an important anastomotic communication between the branches of the external carotid, subclavian, and axillary arteries.

The *Superficialis cervicis artery* (cervicalis anterior) is a small vessel, which ascends upon the anterior tubercles of the transverse processes of the cervical vertebræ, and distributes branches to the deep muscles and glands of the neck.

The *Profunda cervicis* (cervicalis posterior) passes backwards between the transverse processes of the seventh cervical and first dorsal vertebra, and then ascends the back part of the neck, between the complexus and semi-spinalis colli muscles. It inosculates above with the princeps cervicis of the occipital artery, and below with the posterior scapular.

The *Superior intercostal artery* descends behind the pleura upon the neck of the first two ribs, and inosculates with the first aortic intercostals. It gives off two branches which supply the two first intercostal spaces.

The *Internal mammary artery* descends by the side of the sternum, resting upon the costal cartilages, to the diaphragm: it then pierces the anterior fibres of the diaphragm, and enters the sheath of the rectus, where it inosculates with the epigastric artery, a branch of the external iliac. In the upper part of its course it is crossed by the phrenic nerve, and lower down lies between the triangularis sterni and internal intercostal muscles.

AXILLARY ARTERY.

The *axillary artery* forms a gentle curve through the middle of the axillary space from the lower border of the first rib to the lower border of the latissimus dorsi, where it becomes the brachial.

Relations.—After emerging from beneath the margin of the costo-coracoid membrane, it is in relation with the axillary vein, which lies at first to the inner side, and then in front of the artery. Near the middle of the axilla it is embraced by the two heads of the median nerve, and is covered in by the pectoral muscles. Upon the inner or thoracic side it is in relation, first with the first intercostal muscle; it next rests upon the first serration of the serratus magnus; and is then separated from the chest by the brachial plexus of nerves. By its outer or humeral side it is at first separated from the brachial plexus by a triangular cellular interval; it next rests against the tendon of the subscapularis muscle; and thirdly, upon the coraco-brachialis muscle.

Branches.—The branches of the axilliary artery are—the thoracico-acromialis, superior thoracic, inferior thoracic, thora-

cio-axillaris, subscapular, circumflex anterior, circumflex posterior.

The thoracico-acromialis and superior thoracic are found in the triangular space above the pectoralis minor.

The inferior thoracic and thoracio-axillaris, below the pectoralis minor.

And the three remaining branches below the lower border of the subscapularis.

The thoracio-acromialis is a short trunk, which ascends to the space above the pectoralis minor muscle, and divides into three branches—*thoracic*, which is distributed to the pectoral muscle and mammary gland; *acromial*, which passes outwards to the acromion, and inosculates with the branches of the supra-scapular artery; and *descending*, which follows the interspace between the deltoid and pectoralis major muscles, and is in relation with the cephalic vein.

The *superior thoracic* (short) runs along the upper border of the pecotralis minor, and is distributed to the pectoral muscles and mammary gland, inosculating with the intercostal and mammary arteries.

The *inferor thoracic* (long) runs along the lower border of the pectoralis minor, and is distributed to the pectoral and serratus muscles, and

PLATE 64.*

* *The Axillary and Brachial Arteries, with their Branches.*—1. The deltoid muscle. 2. The biceps. 3. The tendinous process given off from the tendon of the biceps, to the deep fascia of the fore-arm. It is this process which separates the median basilic vein from the brachial artery. 4. The outer border of the brachialis anticus muscle. 5. The supinator longus. 6. The coraco-brachialis. 7. The middle portion of the triceps muscle. 8. Its inner head. 9. The axillary artery. 10. The brachial artery; a dark line marks the limit between these two vessels. 11. The thoracio-acromialis artery dividing into its three branches; the number rests upon the coracoid process. 12. The superior and inferior thoracic arteries. 13. The serratus magnus muscle. 14. The subscapular artery. The posterior circumflex and thoracio-axillaris branches are seen in the figure between the inferior thoracic and subscapular. The anterior circumflex is observed crossing the neck of the humerus between the two heads of the biceps. 15. The superior profunda artery. 16. The inferior profunda. 17. The anastomotica magna, inosculating inferiorly with the anterior ulnar recurrent. 18. The termination of the superior profunda, inosculating with the radial recurrent in the interspace between the brachialis anticus and supinator longus.

mammary gland, inosculating with the superior thoracic, intercostal, and mammary arteries.

The *thoracio-axillaris* is a small branch distributed to the plexus of nerves and glands in the axilla. It is frequently derived from one of the other thoracic branches.

The *subscapular artery*, the largest of the branches of the axillary, runs along the lower border of the subscapularis muscle, to the inferior angle of the scapula, where it inosculates with the posterior scapular, a branch of the subclavian. It supplies, in its course, the muscles on the under surface, and inferior border of the scapula, and side of the chest. At about an inch and a half from the axillary, it gives off a large branch, the *dorsalis scapulæ*, which passes backwards through the triangular space bounded by the teres minor, teres major, and scapular head of the triceps, and beneath the infra-spinatus to the dorsum of the scapula, where it is distributed, inosculating with the supra-scapular and posterior scapular arteries. The dorsalis scapulæ is often larger than the trunk from which it arises.

The *circumflex arteries* wind around the neck of the humerus. The *anterior*, very small, passes beneath the coraco-brachialis and short head of the biceps, and sends a branch upwards along the bicipital groove to supply the shoulder-joint.

The *posterior circumflex*, of larger size, passes backwards through the quadrangular space bounded by the teres minor and major, the scapular head of the triceps and the humerus, and is distributed to the deltoid muscle and joint. Sometimes this artery is a branch of the superior profunda of the brachial. It then ascends behind the tendon of the teres major, and is distributed to the deltoid without passing through the quadrangular space.

BRACHIAL ARTERY.

The *brachial artery* passes down the inner side of the arm, from the lower border of the latissimus dorsi, to the bend of the elbow, where it divides into the radial and ulnar arteries.

Relations.—In its course downwards, it rests upon the coraco-brachialis muscle, internal head of the triceps, and brachialis anticus. To its inner side is the ulnar nerve ; to the outer side the coraco-brachialis and biceps muscles ; and in front, it has the basilic vein, and is crossed by the median nerve. Its relations within its sheath are the venæ comites.

The *branches* of the brachial artery are—the superior profunda, inferior profunda, and anastomotica magna.

The *superior profunda* arises opposite the lower border of the latissimus dorsi, and winds around the humerus, between the triceps and the bone, to the space between the brachialis anticus and supinator longus, where it inosculates with the ra-

dial recurrent branch. It accompanies the musculo-spiral nerve. In its course it gives off the posterior articular artery, which descends to the elbow-joint, and a more superficial branch which inosculates with the interosseous articular artery.

The *inferior profunda* arises from about the middle third of the brachial artery, and descends to the space between the inner condyle and olecranon in company with the ulnar nerve, where it inosculates with the posterior ulnar recurrent.

The *anastomotica magna* is given off nearly at right angles from the brachial, at about two inches above the joint. It passes directly inwards, and divides into two branches which inosculate with the anterior and posterior ulnar recurrent arteries and inferior profunda.

Varieties of the brachial artery.—The most frequent peculiarity in the distribution of branches from this artery is the high division of the radial, which arises generally from about the upper third of the brachial artery, and descends to its normal position at the bend of the elbow. The ulnar artery sometimes arises from the brachial at about two inches above the elbow, and pursues either a superficial or deep course to the wrist: and in more than one instance I have seen the interosseous artery arise from the brachial a little above the bend of the elbow.

RADIAL ARTERY.

The *radial artery*, one of the divisions of the brachial, appears from its direction to be almost the continuation of that trunk. It runs along the radial side of the fore-arm, from the bend of the elbow to the wrist; it there turns around the base of the thumb, beneath its extensor tendons, and passes between the two heads of the first dorsal interosseous muscle, into the palm of the hand. It then crosses the metacarpal bones to the ulnar side of the hand, forming the *deep palmar arch*, and terminates by inosculating with the superficial palmar arch.

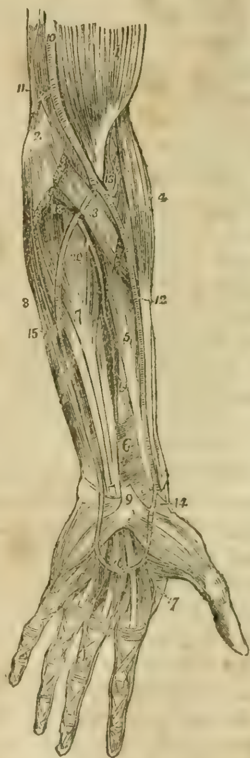
In the upper half of its course, the radial artery is situated between the supinator longus muscle, and pronator radii teres; in the lower half, between the tendons of the supinator longus and flexor carpi radialis. It rests in its course downwards, upon the tendon of the biceps, supinator brevis, pronator radii teres, radial origin of the flexor sublimis, flexor longus pollicis, and pronator quadratus; and is covered in by the integument and fasciæ. At the wrist it is situated beneath the extensor tendons of the thumb; and in the palm of the hand, beneath the flexor tendons. It is accompanied by venæ comites throughout its course, and for its middle third is in close relation with the radial nerve.

The *branches* of the radial artery may be arranged in three groups, corresponding with the three regions, the fore-arm, the

the wrist, and the hand: they are—*fore-arm*, recurrent radial, muscular; *wrist*, superficialis volæ, carpalis anterior, carpalis posterior, metacarpalis, dorsales pollicis; *hand*, princeps pollicis, radialis indicis, interosseæ, perforantes.

ULNAR ARTERY.

PLATE 65.*



The *ulnar artery*, the other division of the brachial artery, crosses the arm obliquely to the commencement of its middle third; it then runs down the ulnar side of the fore-arm to the wrist, crosses the annular ligament, and forms the superficial palmar arch, which terminates by inosculating with the superficialis volæ.

Relations.—In the upper or oblique portion of its course, it lies between the superficial and deep layers of muscles of the fore-arm. In the second part of its course, it is placed between the flexor carpi ulnaris and flexor sublimis digitorum. While crossing the annular ligament, it is protected from injury by a strong tendinous arch, thrown over it from the pisiform bone; and in the palm it rests upon the tendons of the flexor sublimis, being covered in by the palmaris brevis muscle and palmar fascia. It is accompanied in its course by the venæ comites, and is in relation with the ulnar nerve for the lower two thirds of its extent.

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* *The Arteries of the Fore-Arm.*—1. The lower part of the biceps muscle. 2. The inner condyle of the humerus, with the humeral origin of the pronator radii teres and flexor carpi radialis divided across. 3. The deep portion of the pronator radii teres. 4. The supinator longus muscle. 5. The flexor longus pollicis. 6. The pronator quadratus. 7. The flexor profundus digitorum. 8. The flexor carpi ulnaris. 9. The annular ligament, with the tendons passing beneath it into the palm of the hand; the figure is placed on the tendon of the palmaris longus muscle, divided close to its insertion. 10. The brachial artery. 11. The anastomotica magna, inosculating superiorly with the inferior profunda, and inferiorly with the anterior ulnar recurrent. 12. The radial artery. 13. The radial recurrent artery, inosculating with the termination of the superior profunda. 14. The superficialis volæ. 15. The ulnar artery. 16. Its superficial palmar arch, giving off digital branches to three fingers and a half. 17. Branches of the radial artery, supplying one fin-

The *branches* of the ulnar artery may be arranged like those of the radial, into three groups: those of the *fore-arm*, anterior and posterior ulnar recurrent, interosseous (anterior and posterior), muscular; *wrist*, carpalis (anterior and posterior); *hand*, digitales.

The *muscular* branches supply the muscles situated along the ulnar border of the fore-arm.

The *superficial palmar arch* receives the termination of the deep palmar arch from between the abductor minimi digiti and flexor brevis minimi digiti near their origins, and terminates by inosculating with the superficialis volæ upon the ball of the thumb. The communication between the superficial and deep arch is generally described as the communicating branch of the ulnar artery.

The mode of distribution of the arteries to the hand is subject to great variety.

Branches of the Thoracic Aorta.—Bronchial, œsophageal, and intercostal.

The *bronchial arteries* are four in number, and vary both in size and origin. They are distributed to the bronchial glands and tubes, and send branches to the œsophagus, pericardium, and left auricle of the heart. These are the nutritious vessels of the lungs.

The *œsophageal arteries* are numerous small branches, which are distrbuted to the œosphagus, and establish a chain of anastomosis along that tube: the superior inosculate with œsophageal branches of the inferior thyroid arteries, and the inferior with similar branches of the phrenic and gastric arteries.

The *intercostal*, or posterior intercostal arteries, are ten in number on each side, the two superior spaces being supplied by the superior intercostal artery, a branch of the subclavian. The right intercostals are longer than the left, on account of the position of the aorta. They ascend somewhat obliquely from their origin, and cross the vertebral column behind the thoracic duct, vena azygos major, and sympathetic nerve, to the intercostal spaces, the left passing beneath the vena azygos minor and sympathetic. In the intercostal spaces, or rather, upon the external intercostal muscles, each artery gives off a dorsal branch for the supply of the spinal cord and muscles of the back. It then comes into relation with its vein and nerve, the former being above, and the latter below, and divides into two branches which run along the borders of the contiguous ribs between

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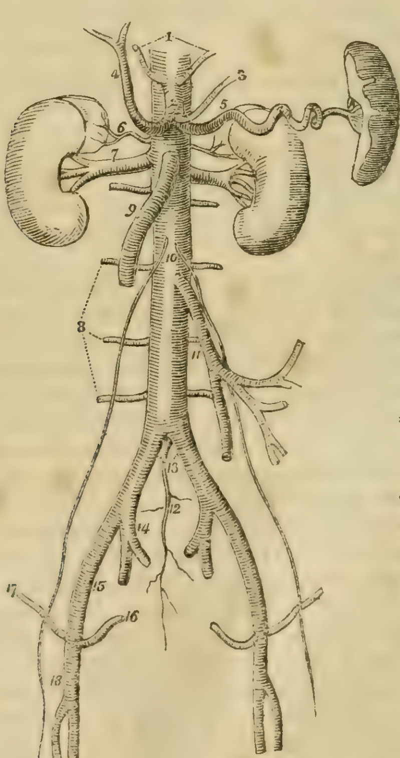
ger and a half. 18. The posterior ulnar recurrent. 19. The anterior interosseous artery. 20. The posterior interosseus, as it is passing through the interosseous membrane.

the two planes of intercostal muscles, and anastomose with the anterior intercostal arteries, branches of the internal mammary. The branch corresponding with the lower border of each rib, is the larger of the two. They are protected from pressure during the action of the intercostal muscles, by little tendinous arches thrown across and attached by each extremity to the bone.

BRANCHES OF THE ABDOMINAL AORTA.

Phrenic, cœliac axis (gastric, hepatic and splenic), superior mesenteric, spermatic, inferior mesenteric, supra-renal, renal, lumbar, and sacra-media.

PLATE 66*.

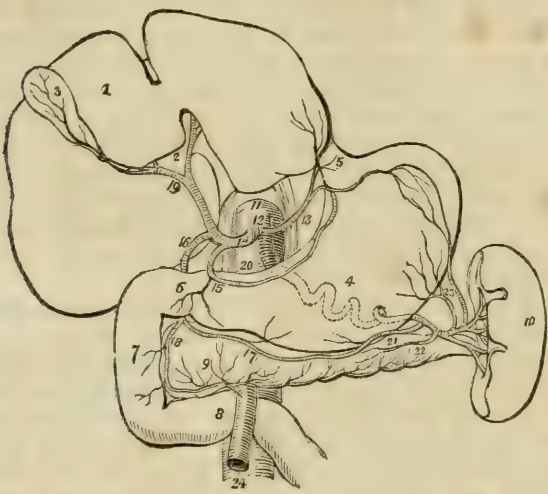


* *The Abdominal Aorta with its Branches.*—1. The phrenic arteries. 2. The cœliac axis. 3. The gastric artery. 4. The hepatic artery, dividing into the right and left hepatic branches. 5. The splenic artery, passing outwards to the spleen. 6. The supra-renal artery of the right side. 7. The right renal artery, which is longer than the left, passing outwards to the right kidney. 8.

The *phrenic arteries* are given off from the anterior part of the aorta as soon as that trunk has passed through the aortic opening. They are distributed to the under surface of the diaphragm, inosculating with branches of the internal mammary, inferior intercostal, epigastric, œsophageal, gastric, hepatic, and supra-renal arteries. They are frequently derived from the cœliac axis, or from one of its divisions, and sometimes they give off the supra-renal arteries.

The *cœliac axis* is the first single trunk given off from the

PLATE 67.*



The lumbar arteries. 9. The superior mesenteric artery. 10. the two spermatic arteries. 11. The inferior mesenteric artery. 12. The sacra media. 13. The common iliacs. 14. The internal iliac of the right side. 15. The external iliac artery. 16. The epigastric artery. 17. The circumflexa ilii artery. 18. The femoral artery.

* *The Distribution of the Branches of the Cœliac Axis.*—1. The liver. 2. Its transverse fissure. 3. The gall bladder. 4. The stomach. 5. The entrance of the œsophagus. 6. The pylorus. 7. The duodenum, its descending portion. 8. The transverse portion of the duodenum. 9. The pancreas. 10. The spleen. 11. The aorta. 12. The cœliac axis. 13. The gastric artery. 14. The hepatic artery. 15. Its pyloric branch. 16. The gastro-duodenalis. 17. The gastro-epiploica dextra. 18. The pancreatico-duodenalis, inosculating with a branch from the superior mesenteric artery. 19. The division of the hepatic artery into its right and left branches; the right giving off the cystic branch. 20. The splenic artery, traced by dotted lines behind the stomach to the spleen. 21. The gastro-epiploica sinistra, inosculating along the great curvature of the stomach with the gastro-epiploica dextra. 22. The pancreatica magna. 23. The vasa brevia to the great end of the stomach, inosculating with the branches of the gastric artery. 24. The superior mesenteric artery, emerging from between the pancreas and the transverse portion of the duodenum.

abdominal aorta. It arises opposite the upper border of the first lumbar vertebra, is about half an inch in length, and divides into three large branches—gastric, hepatic, and splenic.

Relations.—The trunk of the cœliac axis is in relation on each side with the semilunar ganglion, and is surrounded by the solar plexus. It is covered in and concealed in the examination of the abdomen by the lesser omentum.

The *gastric artery*, the smallest of the three branches of the cœliac axis, ascends between the two layers of lesser omentum to the cardiac orifice of the stomach, then runs along the lesser curvature to the pylorus and inosculates with the pyloric branch of the hepatic. It is distributed to the lower extremity of the œsophagus and lesser curve of the stonach, anastomoses with the œsophageal arteries and vasa brevia of the splenic artery.

The *hepatic* artery curves forwards, and ascends along the right border of the lesser omentum to the liver, where it divides into two branches (right and left), which enter the transverse fissure, and are distributed along the portal canals to the right and left lobes. It is in relation in the right border of the lesser omentum, with the ductus communis choledochus and portal vein, and is surrounded by the hepatic plexus of nerves and numerous lymphatics.

The *branches* are—the pyloric, gastro-duodenalis (gastro-epiploica dextra, pancreatico-duodenalis), and cystic.

The *splenic* artery, the largest of the three branches of the cœliac axis, passes horizontally to the left along the upper border of the pancreas, and divides into five or six large branches which are distributed to the spleen. In its course it is tortuous and serpentine, and frequently makes several complete turns upon itself. It is accompanied by the splenic vein, and by the splenic plexus of nerves.

The *branches* of the splenic artery are—pancreaticæ parvæ, pancreatica magna, vasa brevia, and gastro-epiploica sanistra.

The *superior mesenteric* artery, the second of the single trunks, and the largest of the branches of the abdominal aorta, arises immediately below the cœliac axis, and behind the pancreas. It then passes forwards between the pancreas and transverse duodenum, and descends within the layers of the mesentery to the right iliac fossa, where it terminates, very much diminished in size. It forms a curve in its course, the convexity being directed towards the left, and the concavity to the right; it is in relation near its commencement with the portal vein; and is accompanied by two veins, and the superior mesenteric plexus of nerves.

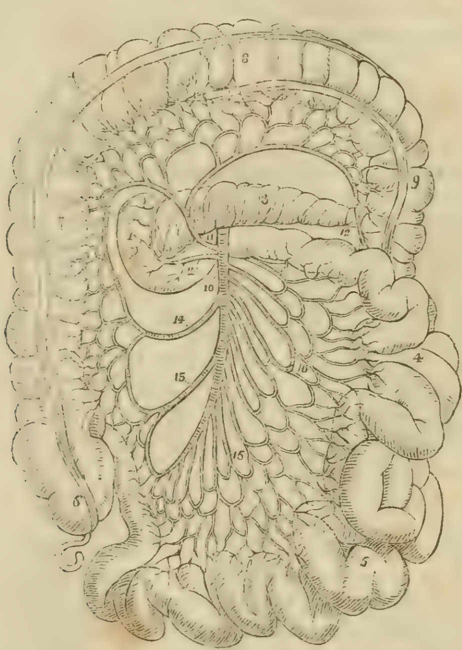
The *branches* of the superior mesenteric artery are—the vasa intestini tenuis, ilio-colica, colica dextra, and colica media.

The *spermatic* arteries are two small vessels which arise

from the front of the aorta below the superior mesenteric; from this origin each artery passes obliquely outwards, and accompanies the corresponding ureter along the front of the psoas muscle to the border of the pelvis, where it is in relation with the external iliac. It is then directed outwards to the internal abdominal ring, and follows the course of the spermatic cord along the spermatic canal and through the scrotum to the testicle, to which it is distributed. The right spermatic artery lies in front of the vena cava, and both vessels are accompanied by their corresponding veins, and spermatic plexuses of nerves.

The spermatic arteries in the female descend into the pelvis, and pass between the two layers of the broad ligaments of the

PLATE 68.*



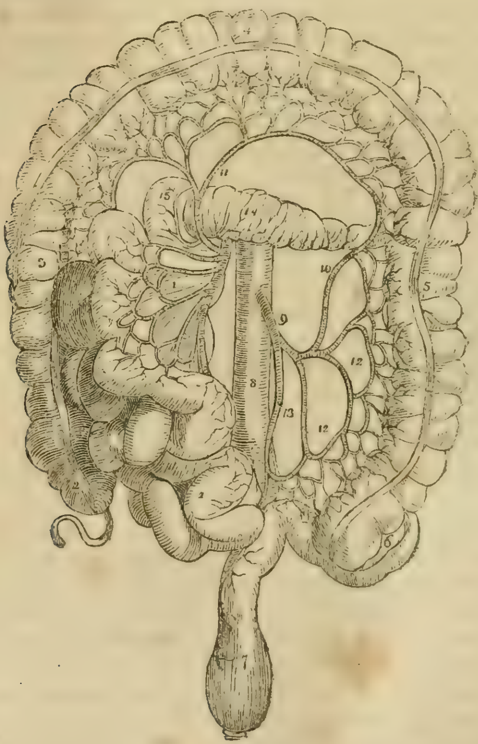
* *The Course and Distribution of the Superior Mesenteric Artery.*—1. The descending portion of the duodenum. 2. The transverse portion. 3. The pancreas. 4. The jejunum. 5. The ileum. 6. The cæcum. 7. The ascending colon. 8. The transverse colon. 9. The commencement of the descending colon. 10. The superior mesenteric artery. 11. The colica media. 12. The branch which inosculates with the colica sinistra. 13. The branch of the mesenteric artery which inosculates with the pancreatico-duodenalis. 14. The colica dextra. 15. The ilio-colica. 16, 16. The branches from the convexity of the superior mesenteric to the small imtestines.

uterus, to be distributed to the ovaries, Fallopean tubes, and round ligaments, along which they are continued to the inguinal canal and labia at each side.

The *inferior mesenteric* artery, smaller than the superior. arises from the abdominal aorta about two inches below the origin of that vessel, and descends between the layers of the left mesocolon, to the left iliac fossa, where it divides into three *branches*, viz :—the colica sinistra, the sigmoideæ, and superior hæmorroidal.

The *supra-renal* are two small vessels, sometimes branches,

PLATE 69.*



* *The Distribution and Branches of the Inferior Mesenteric Artery.*—1, 1. The superior mesenteric artery, with its branches and the small intestines turned over to the right side. 2. The cæcum and appendix cæci. 3. Ascending colon. 4. Transverse colon. 5. Descending colon. 6. Its sigmoid flexure. 7. The rectum. 8 The aorta. 9. The inferior mesenteric artery. 10. The colica sinistra, inosculating with 11, the colica media, a branch of the superior mesenteric artery. 12, 12. Sigmoid branches. 13. The superior hæmorahoidal artery. 14. The pancreas. 15. The descending portion of the duodenum.

of the phrenic or renal arteries, distributed to the supra-renal capsules.

The *renal* arteries (emulgent) are two large trunks given off from the sides of the aorta, immediately below the superior mesenteric artery; the right is longer than the left, on account of the position of the aorta, and passes behind the vena cava to the kidney of that side. The left is somewhat higher than the right. They divide into several large branches previously to entering the kidney, and ramify minutely in its vascular portion.

The *lumbar* arteries correspond with the intercostals in the chest; they are five in number on each side, and curve around the bodies of the lumbar vertebræ beneath the psoas muscles, and divide into two branches, one of which passes backwards between the transverse processes and is distributed to the muscles of the back, whilst the other supplies the abdominal muscles.

The *sacra media* arises from the posterior part of the aorta, at its bifurcation, and descends along the middle of the anterior surface of the sacrum to the coccyx. It distributes branches to the rectum and anterior sacral nerves, and inosculates with the lateral sacral arteries.

Varieties in the branches of the abdominal aorta.—The phrenic arteries are very rarely both derived from the aorta. One or both may be branches of the cæliac axis; one may proceed from the gastric artery, from the renal, or from the upper lumbar artery. There are occasionally three or more phrenic arteries. The cœliac axis is very variable in length, and gives off its branches irregularly. There are sometimes two or even three hepatic arteries, one of which may be derived from the gastric or even from the superior mesenteric. The colica media is sometimes derived from the hepatic artery. The spermatic arteries are very variable both in origin and number. The right spermatic may be a branch of the renal artery, and the left a branch of the inferior mesenteric. The supra-renal arteries may be derived from the phrenic or renal arteries. The renal arteries present several varieties in number; there may be three or even four arteries on one side, and one only on the other. When there are several renal arteries on one side, one may arise from the common iliac artery.

COMMON ILIAC ARTERIES.

The abdominal aorta divides opposite the fourth lumbar vertebra into the two common iliac arteries. Sometimes the bifurcation takes place as high as the third, and occasionally as low as the fifth lumbar vertebra. The common iliac arteries are about two inches and a half in length; they diverge from the termination of the aorta, and pass downwards and outwards to

the margin of the pelvis opposite the sacro-iliac symphyses, where they divide into the internal and external iliac arteries.

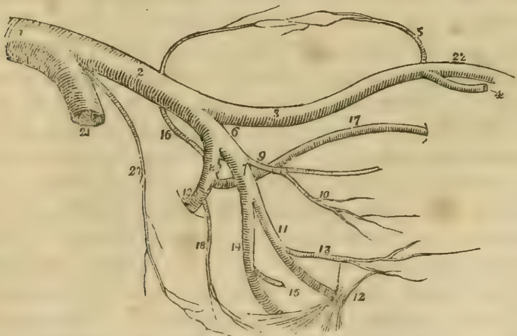
The *left* common iliac is somewhat longer than the right and forms a more obtuse angle with the termination of the aorta; the angle of bifurcation is greater in the female than in the male.

Relations.—The relations of the two arteries are different on the two sides of the body. The right common iliac is in relation in front with the peritoneum, and is crossed near its bifurcation by the ureter. It is in relation posteriorly with the two common iliac veins, and externally with the psoas magnus. The left is in relation in front with the peritoneum, and is crossed by the rectum and inferior mesenteric artery, and at its bifurcation by the ureter. It is in relation behind with the left common iliac vein, and externally with the psoas magnus.

INTERNAL ILIAC ARTERY.

The internal iliac artery is a short trunk, which descends obliquely to the upper margin of the great sacro ischiatic foramen, and divides into an anterior and posterior trunk.

PLATE 70.*



* *The Distribution and Branches of the Iliac Arteries.*—1. The aorta. 2. The left common iliac artery. 3. the external iliac. 4. The epigastric artery. 5. The circumflexa ilii. 6. The internal iliac artery. 7. Its anterior trunk. 8. Its posterior trunk. 9. The umbilical artery giving off 10, the superior vesical artery. After the origin of this branch, the umbilical artery becomes converted into a fibrous cord—the umbilical ligament. 11. The internal pudic artery passing behind the spine of the ischium (12) and lesser sacro-ischiatic ligament. 13. The middle hæmorrhoidal artery. 14. The ischiatic artery, also passing behind the anterior sacro ischiatic ligament to escape from the pelvis. 15. Its inferior vesical branch. 16. The illo lumbar, the first branch of the posterior trunk (8) ascending to inosculate with the circumflexa ilii artery (5) and form an arch along the crest of the ilium. 17. The obturator artery. 18. The lateral sacral. 19. The gluteal artery escaping from the pelvis through the upper part of the great sacro-ischiatic foramen. 20. The sacra media. 21. The right common iliac artery cut off. 22. The femoral artery.

Relations.—This artery rests externally upon the sacral plexus and origin of the pyriformis muscle; posteriorly it is in relation with the internal iliac vein, and anteriorly with the ureter.

Branches.—The branches of the anterior trunk are—the umbilical, middle vesical, middle hæmorrhoidal, ischiatic, and internal pudic.

And of the posterior trunk, the ilio lumbar, obturator, lateral sacral, and gluteal.

The *ischiatic* artery is one of the terminal branches of the anterior division of the internal iliac. It passes downwards between the posterior border of the levator ani, and the pyriformis, to the lower border of the great ischiatic notch, and escapes from the pelvis below the pyriformis muscle. It then descends in the space between the trochanter major and the tuberosity of the ischium in company with the ischiatic nerves and divides into branches.

Its branches within the pelvis are hæmorrhoidal, which supply the rectum conjointly with the middle hæmorrhoidal and sometimes take the place of that artery, and inferior vesical, which are distributed to the base of the bladder, vesiculæ seminales, and prostate gland. The branches external to the pelvis, are four in number—coccygeal, inferior gluteal, comes nervi ischiatici, and muscular branches.

The *internal pudic* artery, the other terminal branch of the anterior trunk of the internal iliac, descends with the ischiatic artery to the lower border of the great ischiatic foramen. It emerges from the pelvis through the great sacro-ischiatic foramen, below the pyriformis muscle, crosses the spine of the ischium, and re enters the pelvis through the lesser sacro ischiatic foramen; it then crosses the internal obturator muscle to the ramus of the ischium, being situated at about an inch from the margin of the tuberosity, and bound down by the obturator fascia; it next ascends the ramus of the ischium, enters between the two layers of the deep perineal fascia lying along the border of the ramus of the pubis, and at the symphysis pierces the anterior layer of the deep perineal fascia, and, very much diminished in size, reaches the dorsum of the penis, along which it runs, supplying that organ under the name of dorsalis penis.

Branches.—The branches of the internal pudic artery within the pelvis, are the hæmorrhoidal, which supplies the middle of the rectum, and frequently takes the place of the middle hæmorroidal branch of the internal iliac.

The branches external to the pelvis, are, the external hæmorrhoidal, superficialis perinei, transversalis perinei, arteria bulbosi, arteria corporis cavernosi, and arteria dorsalis penis.

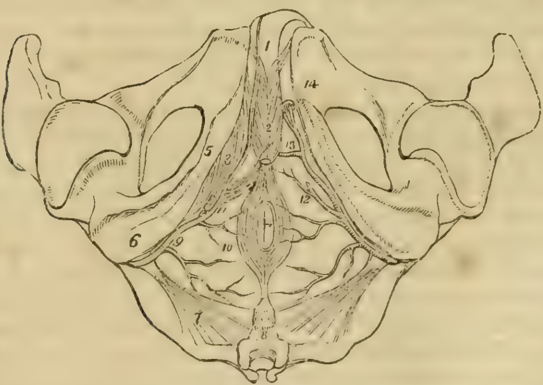
The internal pudic artery is smaller in the female than in the male; its branches, with their distribution, are the same. The

artery of the bulb supplies the vestibule and the meatus urinarius.

The *obturator* artery passes forwards a little below the brim of the pelvis, to the upper border of the obturator foramen. It there escapes from the pelvis through a tendinous arch formed by the obturator membrane, and divides into two branches; anterior, which rests upon the adductor brevis, supplying that muscle, together with the pectineus and adductor longus; and posterior, which follows the direction of the obturator externus muscle to the space between the gemellus inferior and quadratus femoris, where it inosculates with the ischiatic artery. It sends a branch through the notch in the acetabulum to the hip-joint.

The *lateral sacral* is a small artery which descends along the side of the sacrum, and sends branches through the anterior sacral foramina to supply the sacral nerves. It inosculates with the sacra media and with its fellow of the opposite side. There are generally two lateral sacral arteries at each side.

PLATE 71.*



* *The Arteries of the Perineum.*—On the right side the superficial arteries are seen, and on the left the deep. 1. The penis, consisting of corpus spongiosum and corpus cavernosum. The crus penis on the left side is cut through. 2. The acceleratores urinæ muscles, enclosing the bulbous portion of the corpus spongiosum. 3. The erector penis, spread out upon the crus penis of the right side. 4. The anus, surrounded by the sphincter ani muscle. 5. The ramus of the ischium and pubis. 6. The tuberosity of the ischium. 7. The lesser sacro-ischiatic ligament, attached by its small extremity to the spine of the ischium. 8. The coccyx. 9. The internal pudic artery, crossing the spine of the ischium, and entering the perineum. 10. External hæmorrhoida branches. 11. The superficialis perinei artery, giving off a small branch, transversalis perinei, upon the transversus perinei muscle. 12. The same artery on the left side cut off. 13. The artery of the bulb. 14. The two terminal branches of the internal pudic artery; one is seen entering the divided extremity of the crus penis, the artery of the corpus cavernosum; the other, the dorsalis penis, ascends upon the dorsum of the organ.

The *gluteal* artery is the continuation of the posterior trunk of the internal iliac; it passes backwards through the upper part of the great sacro-ischiatic foramen, above the pyriformis muscle, and divides into three branches—superficial, deep surior, and deep inferior.

The *uterine* and *vaginal* arteries of the female are derived either from the internal iliac, or from the umbilical, internal pudic, or ischiatic arteries. The former are very tortuous in their course, and ascend between the layers of the broad ligament, to be distributed to the uterus. The latter ramify upon the exterior of the vagina, and supply its mucous membrane.

Varieties in the branches of the internal iliac.—The most important of the varieties occurring among the branches is the origin of the dorsal artery of the penis from the internal iliac or ischiatic. The artery in this case passes forwards by the side of the prostrate gland, and through the upper part of the deep perineal fascia. It would be endangered in the operation for lithotomy. The dorsal artery of the penis is semetimes derived from the obturator, and sometimes from one of the external pudic arteries. The artery of the bulb, in its normal course, passes almost transversely inwards to the corpus spongiosum. Occasionally, however, it is so oblique in its direction as to render its division in lithotomy unavoidable. The obturator artery may be very small or altogether wanting, its place being supplied by a branch from the external iliac or epigastric.

EXTERNAL ILIAC ARTERY.

The *external iliac* artery of each side passes obliquely downwards, along the inner border of the psoas muscle, from opposite the sacro-iliac symphysis to the femoral arch, where it becomes the femoral artery.

Relations.—It is in relation, in front, with the peritoneum and a thin layer of fascia, derived from the iliac fascia which surrounds the artery and vein. At its commencement it is crossed by the ureter, and near its termination by the crural branch of the genito-crural nerve. Externally, it lies against the psoas musele, from which it is separated by the iliac fascia; and posteriorly it is in relation with the external iliac vein, which at the femoral arch becomes placed to its inner side. The artery is surrounded throughout the whole of its course by lymphatic vessels and glands.

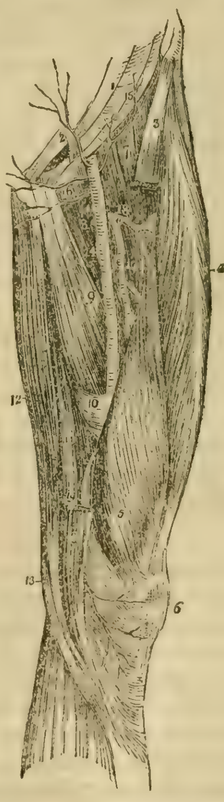
Branches.—Besides several small branches which supply the glands surrounding the artery, the external iliac gives off two branches—the epigastric and circumflexa ilii.

FEMORAL ARTERY.

Emerging from beneath Poupart's ligament, the external iliac artery enters the thigh and becomes the femoral. The femoral

artery passes down the inner side of the thigh, from Poupart's ligament, at a point midway between the anterior superior spinous process of the ilium and symphysis pubis, to the hole in the adductor magnus, at the junction of the middle with the inferior third of the thigh, where it becomes the popliteal artery.

PLATE 72.*



The femoral artery and vein are enclosed in a firm sheath, *femoral* or *crural canal*, which is formed for the greater part of its extent by fibrous and cellular tissue, and by a process of fascia sent inwards from the fascia lata. Near Poupart's ligament this sheath is much larger than the vessels it contains, and is continuous with the fascia transversalis, and iliac fascia. If the sheath be opened at this point, the artery will be seen to be situated in contact with the outer wall of the sheath. The vein lies next to the artery, being separated from it by a fibrous septum, and between the vein and the inner wall of the sheath, and divided from the vein by another thin fibrous septum, is a triangular interval, into which the sac is protruded in femoral hernia. This space is occupied in the normal state of the parts by loose cellular tissue, and lymphatic vessels which pierce the inner wall of the sheath to make their way to a gland, situated in the femoral ring.

Relations.—The upper third of the femoral artery is superficial, being covered only by the integument

* *View of the Anterior and Inner Aspect of the Thigh—showing the Coures and Branches of the Femoral Artery.*—1. The lower part of the aponeurosis of the external oblique muscle; its inferior margin is Poupart's ligament. 2. The external abdominal ring. 3, 3. The sartorius muscle; its middle portion has been removed. 4. The rectus. 5. The vastus internus. 6. The patella. 7. The iliacus and psoas, the latter being nearest the artery. 8. The pectineus. 9. the adductor longus. 10. The tendinous canal for the femoral artery, formed by the adductor magnus, and vastus internus muscles. 11. The adductor magnus. 12. The gracilis. 13. The tendon of the semi-tendinosus. 14. The femoral artery, 15. The superficial circumflexa ilii, taking its course along the line of Poupart's ligament, to the crest of the ilium. 2. The superficial epigastric artery. 16. The two external pudic arteries, superficial and deep. 17. The profunda artery, giving off 18, its external circumflex branch;

and superficial and deep fasciæ. The lower two thirds are covered by the sartorius muscle. To its outer side the artery is first in relation with the psoas, next with the rectus, and then with the vastus internus. Behind, it rests upon the inner border of the psoas muscle ; it is next separated from the pectineus vein, profunda vein and artery, and then lies on the adductor by the femoral longus to its termination. Near the lower border of the adductor longus, it is placed in an aponeurotic canal, formed by an arch of tendinous fibres, thrown from the border of the adductor longus, and the border in the opening of the adductor magnus, to the side of the vastus internus.

The immediate *relations* of the artery, are the femoral vein and two saphenous nerves. The vein at Poupart's ligament lies to the inner side of the artery, but lower down gets altogether behind it. The short saphenous nerve lies to the outer side, and somewhat upon the sheath for the lower two thirds of its extent, and the long saphenous is situated within the sheath for the same extent.

Branches.—The branches of the femoral artery are—the superficial circumflexa ilii, superficial epigastric, superficial external and deep external pudic, profunda, muscular, and anastomotica magna.

The *profunda femoris* arises from the femoral artery at two inches below Poupart's ligament; it passes downwards and backwards, and a little outwards, behind the adductor longus muscle, pierces the adductor magnus, and is distributed to the flexor muscles of the leg.

Relations.—In its course downwards, it rests successively upon the conjoined tendon of the psoas and iliacus, the pectineus, adductor brevis, and adductor magnus muscles. To its outer side, the tendinous insertion of the vastus internus muscle intervenes between it and the femur, and in front it is separated from the femoral artery above by the profunda vein and femoral vein, and below by the adductor longus muscle.

The *branches* of the profunda artery are the external and internal circumflex, and three perforating arteries.

POPLITEAL ARTERY.

The *popliteal artery* commences from the termination of the femoral, at the opening in the adductor magnus muscle, and passes obliquely outwards through the middle of the popliteal space to the lower border of the popliteus muscle, where it divides into the anterior and posterior tibial arteries.

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and lower down, the three perforantes. A small bend of the internal circumflex artery (8) is seen behind the inner margin of the femoral, just below the deep external pudic artery. 19. The anastomotica magna, descending to the knee upon which it ramifies.

Relations.—In its course downwards, it rests first on the femur, then on the posterior ligament of the knee joint, then on the fascia covering the popliteus muscle; superficial and external to it is the popliteal vein, and still more superficial and external, the popliteal nerve.

The *branches* of the popliteal artery are—the superior external and internal articular, the azygos articular, the inferior external and internal articular, and the sural.

ANTERIOR TIBIAL ARTERY.

The *anterior tibial* artery passes forwards between the two heads of the tibialis posticus muscle, and through the opening in the upper part of the interosseous membrane, to the anterior tibial region. It then runs down the anterior aspect of the leg to the ankle joint, where it becomes the dorsalis pedis.

PLATE 73.*

Relations.—In its course downwards, it rests upon the interosseous membrane, the tibia, and the anterior ligament of the joint. In the upper third of its course it is situated between the tibialis anticus and extensor longus digitorum; lower down, between the tibialis anticus and extensor proprius pollicis; and just before it reaches the ankle it is crossed by the tendon of the extensor proprius pollicis, and becomes placed between that tendon and the tendons of the extensor longus digitorum. Its immediate relations are the venæ comites and the anterior tibial nerve, which lies at first to its outer side, and at about the middle of the leg becomes placed superficially to the artery.

The *branches* of the anterior tibial artery are—the recurrent, muscular, and external and internal malleolar.

The *dorsalis pedis* artery is continued forwards along the tibial side of the dorsum of the foot, from the ankle to the base of the metatarsal bone of the great toe, where it divides into two branches, the dorsalis hallucis and communicating.

Relations.—The dorsalis pedis is situated along the outer border of the tendon of the extensor proprius pollicis; on its fibular side is the innermost tendon of the extensor longus digitorum, and near to its termination it

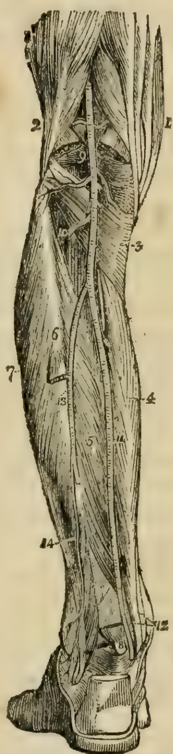
* *The Anterior Aspect of the Leg and Foot*—showing the anterior tibial and dorsalis pedis arteries, with their branches.—1. The tendon of insertion of the

is crossed by the inner tendon of the extensor brevis digitorum. It is accompanied by venæ comites, and has the continuation of the anterior tibial nerve to its outer side.

The *branches* of this artery are—the tarsea, the metatarsea, (interossæ) the dorsalis hallucis (collateral digital), and the communicating.

POSTERIOR TIBIAL ARTERY.

PLATE 74.*



The *posterior tibial* artery passes obliquely downwards along the tibial side of the leg, from the lower border of the popliteus muscle to the inner ankle, where it divides into the internal and external plantar arteries.

Relations.—In its course downwards it lies first upon the tibialis posticus, next upon the flexor longus digitorum, and then upon the tibia, and is covered in by the intermuscular fascia. It is accompanied by its venæ comites, and by the posterior tibial nerve, which lies at first to its outer side, then superficially to it, and again to its outer side.

The *branches* of the posterior tibial artery are—the peroneal, muscular, and internal and external plantar. The *peroneal* artery is given off from the posterior tibial at about two inches below the lower border of the popliteus muscle, and passes obliquely outwards to the fibula. It then runs downwards along the inner border of the fibula to its lower third, where it divides into the anterior and posterior peroneal artery.

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quadriceps extensor muscle. 2. The patella. 3. The tibia. 4. The extensor proprius pollicis muscle. 5. The extensor longus digitorum. 6. The peronei muscles. 7. The inner belly of the gastrocnemius and soleus. 8. The annular ligament, beneath which the tendons and anterior tibial artery pass into the dorsum of the foot. 9. Anterior tibial artery. 10. Its recurrent branch, inosculating with (2) the inferior articular, and (1) the superior articular arteries, branches of the popliteal. 11. The internal malleolar artery. 17. The external malleolar, inosculating with the anterior peroneal artery, 12. 13. The dorsalis pedis artery. 14. The tarsea and metatarsea arteries; the tarsea is nearest the ankle, the metatarsea is seen giving off interossæ. 15. The dorsalis hallucis artery. 16. The communicating branch.

* *A Posterior View of the Leg*—showing the popliteal and posterior tibial arteries. 1. The tendons forming the inner hamstring. 2. The tendon of the

Relations.—The peroneal artery rests upon the tibialis posticus muscle, and is covered in by the flexor longus pollicis, having the fibula to its outer side.

The *branches* of the peroneal artery are muscular to the neighboring muscles, and the two terminal branches anterior and posterior peroneal.

PLATE 75.*

The anterior peroneal pierces the interosseous membrane at the lower third of the leg, and is distributed on the front of the outer malleolus, anastomosing with the internal malleolar and tarsal arteries.

The *posterior peroneal* continues onwards to the posterior aspect of the outer malleolus, anastomosing with the anterior peroneal, tarsal, external plantar, and posterior tibial arteries.

The *muscular* branches of the posterior tibial artery are distributed to the muscles on the posterior aspect of the leg.

PLANTAR ARTERIES.

The *internal plantar* artery proceeds from the bifurcation of the posterior tibial at the inner malleolus, and passes along the inner border of

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biceps forming the outer hamstring. 3. The popliteus muscle. 4. The flexor longus digitorum. 5. The tibialis posticus. 6. The fibula; immediately below the figure is the origin of the flexor longus pollicis; the muscle has been removed in order to expose the peroneal artery. 7. Peronei muscles. 8. The lower part of the flexor longus pollicis muscle, with its tendon. 9. The popliteal artery, giving off its articular and muscular branches; the two superior articular are seen in the upper part of the popliteal space, passing above the two heads of the gastrocnemius muscle, which are cut through near to their origin. The two inferior are in relation with the popliteus muscle. 10. The anterior tibial artery, passing through the angular interspace between the two heads of the tibialis posticus muscle. 11. The posterior tibial artery. 12. The relative position of the tendons and artery at the inner ankle, from within outwards, previously to their passing beneath the internal annular ligament. 13. The peroneal artery, dividing into two branches; the anterior peroneal is seen piercing the interosseous membrane. 14. The posterior peroneal.

* *The Arteries of the Sole of the Foot.*—The first and a part of the second layer of muscles has been removed. 1. The under and posterior part of the os calcis, to which the origins of the first layer of muscles remain attached. 2. The musculus accessorius. 3. The long flexor tendons. 4. The tendon of the peroneus longus. 5. The termination of the posterior tibial artery. 6. The internal plantar. 7. The external plantar artery. 8. The plantar arch, giving off four digital branches, which pass forwards on the interossei muscles to divide into collateral branches.

the foot, between the abductor pollicis and flexor brevis digitorum muscles, supplying the inner border of the foot and great toe.

The *external plantar* artery, much larger than the internal, passes obliquely outwards between the first and second layers of the plantar muscles, to the fifth metatarsal space. It then turns horizontally inwards, between the second and third layers, to the first metatarsal space, where it inosculates with the communicating branch from the dorsalis pedis. The horizontal portion of the artery describes a slight curve, having the convexity forwards; this is the plantar arch.

The *branches* of the external plantar artery are—the muscular, digital, and posterior perforating.

The *muscular* branches are distributed to the muscles in the sole of the foot.

The *digital* branches are four in number: the first is distributed to the outer side of the little toe; the three others pass fowards to the cleft between the toes, and divide into collateral branches, which supply the adjacent sides of the three external toes, and the outer side of the second.

The *posterior perforating* are three small branches, which pass upwards between the heads of the three external dorsal interossei muscles, to inosculate with the arch formed by the metatarsea artery.

PULMONARY ARTERY.

The *pulmonary artery* arises from the left side of the base of the right ventricle in front of the origin of the aorta, and ascends obliquely to the under surface of the arch of the aorta, where it divides into the right and left pulmonary arteries. In its course upwards and backwards it inclines to the left side, crossing the commencement of the aorta, and is connected to the under surface of the arch by a ligamentous cord, the remains of the ductus arteriosus.

Relations.—It is enclosed for one half of its extent by the pericardium, and receives the attachment of the fibrous portion of the pericardium by its upper portion. Behind it rests against the ascending aorta; on either side is the appendix of the corresponding auricle and a coronary artery; and above, the cardiac ganglion and the remains of the ductus arteriosus.

The *right pulmonary* artery passes beneath the arch and behind the ascending aorta and in the root of the lungs divides into three branches for the three lobes.

The *left pulmonary* artery rather larger than the right, passes in front of the descending aorta, to the root of the left lung to which it is distributed. These arteries divide and subdivide in the structure of the lungs, and terminate in capillary vessels

which form a network around the bronchial cells, and terminate in the radicles of the pulmonary veins.

Relations.—In the root of the right lung examined from above downwards, the pulmonary artery is situated between the bronchus, and pulmonary veins; the former being above, the latter below; while in the left lung the artery is the highest, next the bronchus, and then the veins. On both sides, from before backwards, the artery is situated between the veins and bronchus, the former being in front, and the latter behind.

OF THE VEINS.

The *veins* are the vessels which return the blood to the auricles of the heart, after it has been circulated by the arteries through the various tissues of the body. They are much thinner in structure than the arteries, so that when emptied of their blood they become flattened and collapsed. The veins of the systemic circulation convey the dark-coloured and impure or venous blood, from the capillary system to the right auricle of the heart, and are found after death to be more or less distended with that fluid. The veins of the pulmonary circulation resemble the arteries in containing during life the pure or arterial blood, which they transmit from the capillaries of the lungs to the left auricle.

The veins commence by minute radicles in the capillaries which are everywhere distributed through the textures of the body, and converge to constitute larger and larger branches, till they terminate in the large trunks which convey the venous blood directly to the heart. In diameter they are much larger than the arteries, and like those vessels their combined areæ would constitute a cone, whereof the apex would be placed at the heart, and the base at the surface of the body. It follows from this arrangement, that the blood in returning to the heart is passing from a larger to a smaller channel, and therefore increases in rapidity during its course.

Veins admit of a threefold division, into superficial, deep and sinuses.

The *superficial* veins return the blood from the integument and superficial structures, and take their course between the layers of the superficial fascia; they then pierce the deep fascia in the most convenient and protected situation, and terminate in the deep veins. They are unaccompanied by arteries, and are the vessels usually selected for venesection.

The *deep* veins are situated among the deeper structures of the body and generally in relation with the arteries; in the limbs they are enclosed in the same sheath with those vessels, and they return the venous blood from the capillaries of the deep tissues. In company with all the smaller, and also with

the secondary arteries, as the brachial, radial, and ulnar in the upper, and tibial and peroneal in the lower extremity, there are two veins, placed one on each side of the artery, and named *venæ comites*. The larger arteries, as the axillary, subclavian, carotid, popliteal femoral, &c., are accompanied by a single venous trunk. *Sinuses* differ from veins in their structure, and also in their mode of distribution, being confined to especial organs, and situated within their substance. The principal venous sinuses are those of the dura mater, of the diploe, of the cancellous structure of bones, and of the uterus.

The communications between veins are even more frequent than those of arteries, and they take place between the larger, as well as among the smaller vessels; the venæ comites communicate with each other very frequently in their course, by means of short transverse branches which pass from one to the other. These communications are strikingly exhibited in the frequent inosculations of the spinal veins, and in the various venous plexuses, as the spermatic plexus, vesical plexus, &c. The office of these inosculations is very apparent, as tending to obviate the obstructions to which the veins are particularly liable, from the thinness of their coats, and from their inability to overcome much impediment by the force of their current.

Veins are composed of three tunics, external, middle and internal.

The *external*, or cellular coat, is dense and resisting, and resembles the cellular tunic of arteries. The *middle* coat is fibrous, like that of arteries, but extremely thin, so that its existence is questioned by some anatomists. The *internal* coat is serous, and also similar to that of arteries; it is continuous with the lining membrane of the heart at one extremity, and with the lining of the capillaries at the other.

At certain intervals, the internal coat forms folds or duplicatures, which constitute valves. The valves of veins are generally composed of two semilunar folds, one on each side of the cylinder of the vessel, occasionally of a single duplicature, having a spiral direction, and in rare instances of three. The free extremity of the valvular folds is concave, and directed forwards, so that while the current of blood would be permitted to flow freely towards the heart, the valves would become distended and the current intercepted, if the stream became retrograde in its course. Upon the cardiac side of each valve, the vein is expanded into two pouches (sinuses), corresponding with the segments of the valves, which give to the distended or injected vein a knotted appearance. The valves are most numerous in the veins of the extremities, particularly in the deeper veins, and they are generally absent in the smaller veins and in the veins of the viscera, as in the portal and cerebral veins;

they are also absent in the large trunks, as in the venæ cavæ, venæ azygos, innominatæ and iliac veins.

Sinuses are venous channels, excavated in the structure of an organ, and lined by the internal coat of the veins; of this structure are the sinuses of the dura mater, whose external covering is the fibrous membrane, and the internal, the serous layer of the veins. The external investment of the sinuses of the uterus is the tissue of that organ; and that of the bones, the lining membrane of the cells and canals.

Veins, like arteries, are supplied with nutritious vessels, the vasa vasorum; and it is to be presumed that nervous filaments are distributed to their coats.

We shall describe the veins according to the primary division of the body; taking first those of the head and neck, next those of the upper extremity, then those of the lower extremity, and lastly the veins of the trunk.

VEINS OF THE HEAD AND NECK.

The veins of the head and neck may be arranged into three groups, viz. 1. Veins of the exterior of the head. 2. Veins of the diploe and interior of the cranium. 3. Veins of the neck.

The veins of the exterior of the head are—the facial, internal maxillary, temporal, temporo-maxillary, posterior auricular, and occipital.

VEINS OF THE DIPLOE.

The diploe of the bones of the head is furnished in the adult with irregular sinuses, which are formed by a continuation of the serous membrane of the veins into the osseous canals in which they are lodged. At the middle period of life these sinuses are confined to the particular bones; but in old age, after the ossification of the sutures, they may be traced from one bone to the next. They receive their blood from the capillaries supplying the cellular structure of the diploe, and terminate externally in the veins of the pericranium, and internally in the veins and sinuses of the dura mater. These veins are separated from the bony walls of the canals by a thin layer of marrow.

CEREBRAL AND CEREBELLAR VEINS.

The *cerebral* veins are remarkable for the absence of valves, and for the extreme tenuity of their coats. They may be divided into the superficial, and deep or ventricular veins.

The *venæ Galeni* pass backwards in the structure of the velum interpositum; and escaping through the fissure of Bichat, terminate in the straight sinus.

The *cerebellar veins* are disposed, like those of the cere-

brum, on the surface of the lobes of the cerebellum; they are situated, some upon the superior and some upon the inferior surface, while others occupy the borders of the organ. They terminate in the lateral and petrosal sinuses.

SINUSES OF THE DURA MATER.

The sinuses of the dura mater are irregular channels formed by the splitting of the layers of that membrane, and lined upon their inner surface by a continuation of the serous layer of the veins. They may be divided into two groups:—1. Those situated at the upper and back part of the skull. 2. The sinuses at the base of the skull.

The former are—the superior and inferior longitudinal sinuses, the straight sinus, and the occipital and lateral sinuses.

The termination of the superior longitudinal sinus in the two lateral sinuses, forms a considerable dilatation, into which the straight sinus opens from the front, and the occipital sinuses from below. This dilation is named the *torcular Herophili*, and is the point of communication of six sinuses—the superior longitudinal, two lateral, two occipital, and the straight.

The sinuses of the base of the skull are—the cavernous, inferior petrosal, circular, superior petrosal, and transverse.

PLATE 76.*

* *The Sinuses of the Upper and Back part of the Skull.*—1. The superior longitudinal sinus. 2, 2. The cerebral veins opening into the sinus. 3. The falx cerebri. 4. The inferior longitudinal sinus. 5. The straight or fourth sinus. 6. The venæ Galeni. 7. The torcular Herophili. 8. The two lateral sinuses, with the occipital sinuses between them. 9. The termination of the inferior petrosal sinus of one side. 10. The dilatations corresponding with the jugular fossæ. 11. The internal jugular veins.

VEINS OF THE NECK.

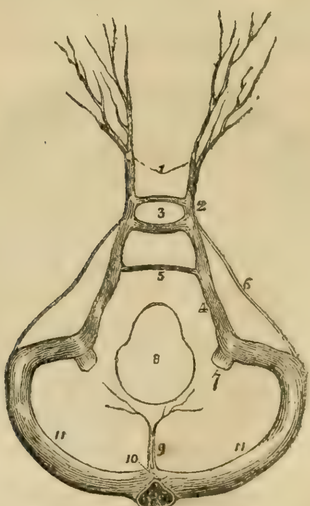
The veins of the neck which return the blood from the head are—the external, anterior and internal jugular, and the vertebral.

VEINS OF THE UPPER EXTREMITY.

The veins of the upper extremity are the deep and superficial. The *deep* veins accompany the branches and trunks of the arteries, and constitute their *venæ comites.* The venæ comites of the radial and ulnar arteries are enclosed in the same sheath with those vessels, and terminate at the bend of the elbow in the brachial veins. The brachial venæ comites are situated one on each side of the artery, and open into the axillary vein; the axillary becomes the subclavian, and the subclavian unites with the internal jugular to form the vena innominata.

The *superficial* veins of the fore-arm are—the anterior ulnar vein, posterior ulnar vein, basilic vein, radial vein, cephalic vein, median vein, median basilic, median cephalic.

PLATE 77.*



* *The Sinuses of the Base of the Skull.*—1. The ophthalmic veins. 2. The cavernous sinus of one side. 3. The circular sinus; the figure occupies the position of the pituitary gland in the cella turcica. 4. The inferior petrosal sinus. 5. The transverse or anterior occipital sinus. 6. The superior petrosal sinus. 7. The internal jugular vein. 8. The foramen magnum. 9. The occipital sinuses. 10. The torcular Herophili. 11, 11. The lateral sinuses.

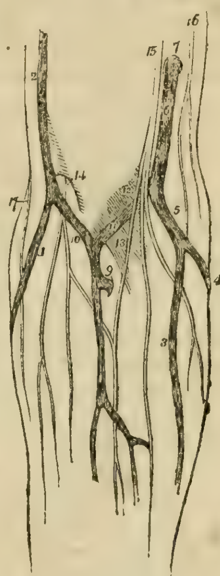
AXILLARY VEIN.

The axillary vein is formed by the union of the venæ comites of the brachial artery with the basilic vein. It lies in front of the artery, and receives numerous branches from the collateral veins of the branches of the axillary artery, and, at the lower border of the first rib, becomes the subclavian vein.

SUBCLAVIAN VEIN.

The subclavian vein crosses over the first rib and beneath the clavicle, and unites with the internal jugular vein to form the vena innominata. It lies at first in front of the subclavian artery, and then in front of the scalenus anticus, which separates it from that vessel. The phrenic and pneumogastric nerves pass between the artery and vein. The veins opening into the subclavian are the cephalic below the clavicle, and the external and anterior jugulars above; occasionally some small veins from the neighboring parts also terminate in it.

PLATE 78.*



VEINS OF THE LOWER EXTREMITY.

The veins of the lower extremity are the deep and superficial. The deep veins accompany the branches of the arteries in pairs, and form the venæ comites of the anterior and posterior tibial and peroneal arteries. These veins unite in the popliteal region to form a single vein of large size—the popliteal—which successively becomes in its course the femoral and the external iliac vein.

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* *The Veins of the Fore-Arm, and Bend of the Elbow.*—1. The radial vein. 2. The cephalic vein. 3. The anterior ulnar vein. 4. The posterior ulnar. 5. The trunk formed by their union. 6. The basilic vein, piercing the deep fascia at 7. 8. The median vein. 9. A communicating branch between the deep veins of the fore-arm and the median vein. 10. The median cephalic vein. 11. The median basilic. 12. A slight convexity of the deep fascia, formed by the brachial artery. 13. The process of fascia, derived from the tendon of the biceps, and separating the median basilic vein from the brachial artery. 14. The external cutaneous nerve, piercing the deep fascia, and dividing into two branches, which pass behind the median cephalic vein. 15. The internal cutaneous nerve, dividing into branches, which pass in front of the median basilic vein. 16. The intercosto-humeral cutaneous nerve. 17. The spiral cutaneous nerve, a branch of the musculo-spiral.

POPLITEAL VEIN.

The popliteal vein ascends through the popliteal region, lying, in the first instance, directly upon the artery, and then getting somewhat to its outer side. It receives several muscular and articular veins, and the external saphenous vein. The valves in this vein are four or five in number.

FEMORAL VEIN.

The femoral vein, passing through the opening in the adductor magnus muscle, ascends the thigh in the sheath of the femoral artery, and entering the pelvis beneath Poupart's ligament, becomes the external iliac vein. In the lower part of its course it is situated upon the outer side of the artery, it then becomes placed behind that vessel, and, at Poupart's ligament, lies to its inner side. It receives the muscular and profunda veins, and through the saphenous opening, the internal saphenous vein. The valves in this vein are four or five in number.

VEINS OF THE TRUNK.

The veins of the trunk may be divided into—1. The superior vena cava, with its formative branches. 2. The inferior vena cava, with its formative branches. 3. The azygos veins. 4. The vertebral and spinal veins. 5. The cardiac veins. 6. The portal vein. 7. The pulmonary veins.

SUPERIOR VENA CAVA.

The superior cava is a short trunk about three inches in length, formed by the junction of the two venæ innominatæ. It descends perpendicularly on the right side of the mediastinum, and entering the pericardium terminates in the upper part of the right auricle.

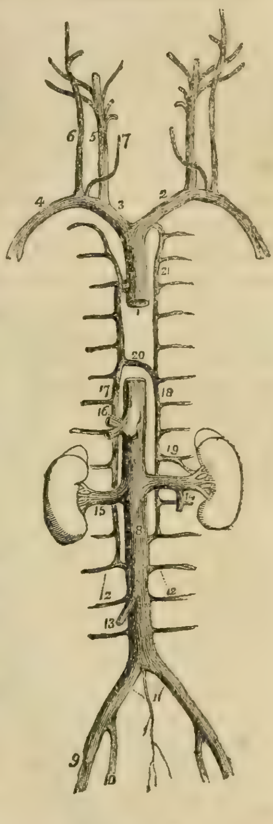
It is in relation in front with the thoracic fascia, which separates it from the thymus gland, and with the pericardium; behind, with the right pulmonary artery, and right superior pulmonary vein; internally, with the ascending aorta; and externally, with the right phrenic nerve, and right lung. Immediately before entering the pericardium it receives the vena azygos major.

INFERIOR VENA CAVA.

The inferior vena cava is formed by the union of the two common iliac veins, upon the intervertebral substance between the fourth and fifth lumbar vertebræ. It ascends along the front of the vertebral column, on the right side of the abdominal aorta, and passing through the fissure in the posterior border of the liver and the quadrilateral opening in the tendinous centre of the diaphragm, terminates in the inferior and posterior part of the right auricle. There are no valves in this vein.

It is in *relation*, from below upwards, in front with the mesentery transverse duodenum, portal vein, pancreas and liver, which nearly and sometimes completely surrounds it; behind, it rests upon the vertebral column and right crus of the diaphragm, from which it is separated by the right renal and lumbar arteries; to the right it has the peritoneum and sympathetic nerve; and to the left, the aorta.

PLATE 79.*



The *branches* which the inferior cava receives in its course, are the lumbar, right spermatic, renal, suprarenal, phrenic, hepatic.

AZYGOS VEINS.

The *azygos* veins form a system of communication between the superior and inferior vena cava, and serve to return the blood from that part of the trunk in which those vessels are deficient, on account of their connection with the heart. This system consists of three vessels, the vena azygos major, vena azygos minor, superior intercostal vein.

VERTEBRAL AND SPINAL VEINS.

The numerous venous plexuses of the vertebral column and spinal cord may be arranged into three groups, the dorsi-spinal, meningo-rachidian, medulli-spinal.

CARDIAC VEINS.

The veins returning the blood from the substance of the heart, are the great cardiac vein, posterior cardiac veins, anterior cardiac veins, venæ Thebesii.

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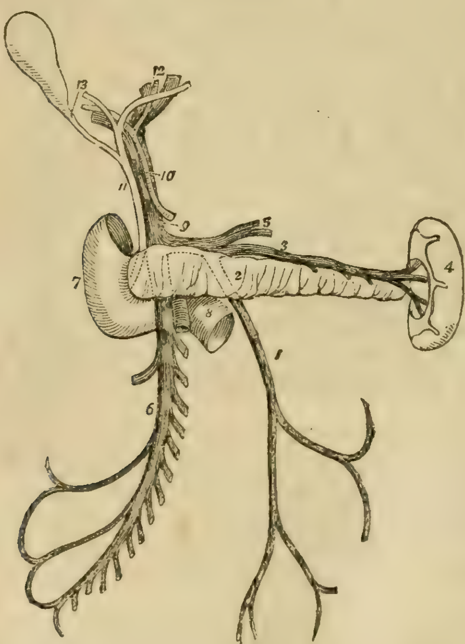
* *The Veins of the Trunk and Neck.*—1. The superior vena cava. 2. The left vena innominata. 3. The right vena innominata. 4. the right subclavian vein. 5. The internal jugular vein. 6. The external jugular. 7. The anterior jugular. 8. The inferior vena cava. 9. The external iliac vein. 10. The internal iliac vein. 11. The common iliac veins; the small vein between these is the vena sacra media. 12, 12. Lumbar vein. 13. The right spermatic vein. 14. The left spermatic, opening into the left renal vein. 15. The right renal vein. 16. The trunk of the hepatic veins. 17. The greater vena azygos, commencing inferiorly in the lumbar veins. 18. The lesser vena azygos, also commencing in the lumbar veins. 19. A branch of communication with the left renal vein. 20. The termination of the lesser in the greater vena azygos. 21. The superior intercostal vein, communicating inferiorly with the lesser vena azygos, and terminating superiorly in the left vena innominata.

PORTAL SYSTEM.

The portal system is composed of four large veins, which return the blood from the chylo-poietic viscera; they are—the inferior and superior mesenteric, the splenic, and the gastric veins.

The *Vena Portæ*, formed by the union of the splenic and superior mesenteric veins behind the pancreas, ascends through the right border of the lesser omentum, to transverse the fissure of the liver, where it divides into two branches, one for each lateral lobe. In the right border of the lesser omentum it is situated behind and between the hepatic artery and ductus communis choledochus, and is surrounded by the hepatic plexus of

PLATE 80*.



* *The Portal Vein.*—1. The inferior mesenteric vein; it is traced by means of dotted lines behind the pancreas (2), to terminate in the splenic vein (3). 4. The spleen. 5. Gastric veins, opening into the splenic vein. 6. The superior mesenteric vein. 7. The descending portion of the duodenum. 8. Its transverse portion, which is crossed by the superior mesenteric vein snd part of the trunk of the superior mesenteric artery. 9. The portal vein. 10. The hepatic artery. 11. The ductus communis choledochus. 12. The division of the duct and vessels at the transverse fissure of the liver. 13. The cystic duct leading to the gall-bladder.

nerves and lymphatics. At the transverse fissure, each primary branch divides into numerous secondary branches, which ramify through the portal canals, and give off vaginal and interlobular veins, which terminate in the lobular venous plexus of the lobules of the liver. The portal vein within the liver receives the venous blood from the capillaries of the hepatic artery.

PULMONARY VEINS.

The pulmonary veins, four in number, return the arterial blood from the lungs to the left auricle of the heart; they differ from the veins in general, in the area of their cylinders, being very little larger than the corresponding arteries, and in accompanying singly each branch of the pulmonary artery. They commence in the capillaries upon the parietes of the bronchial cells, and unite to form a single trunk for each lobe. The vein of the middle lobe of the right lung unites with the superior vein so as to form the two trunks which open into the left auricle. Sometimes they remain separate, and then there are three pulmonary veins on the right side. The right pulmonary veins pass behind the superior vena cava to the left auricle, and the left behind the pulmonary artery; they both pierce the pericardium. Within the lung the branches of the pulmonary veins are behind the bronchial tubes, and those of the pulmonary artery in front; but at the root of the lungs the veins are in front, next the arteries, and then the bronchi. There are no valves in the pulmonary veins.

OF THE LYMPHATICS.

The lymphatic vessels, or absorbents, have received their double appellation from certain phenomena which they present; the former name is derivable from the peculiar limpid fluid (lympha, water) which they convey; and the latter, from their supposed property of absorbing foreign substances into the system. They are minute and delicate vessels, having a knotted appearance, and are distributed through every part of the body. Their office is to collect the products of digestion, and the detrita of nutrition, and convey them into the venous circulation near to the heart.

Lymphatic vessels commence in a delicate network which is distributed upon the cutaneous surface of the body, upon the various surfaces of organs and throughout their internal structure; and from this network the lymphatic vessels proceed, nearly in straight lines, in a direction towards the root of the neck. In their course they are intercepted by numerous small oval or rounded bodies—lymphatic glands—in which the entering or *inferent vessels* ramify to an extreme minuteness,

and from which proceed the escaping or *efferent vessels* somewhat larger in size and fewer in number, to be again and again subdivided in other glands, and a little more increased in size.

Lymphatic vessels admit of a threefold division into superficial, deep, and lacteals. The *superficial* lymphatic vessels, upon the surface of the body, follow the course of the veins, and pierce the deep fascia inconvenient situations, to join the deep lymphatics. Upon the surface of organs they converge to the nearest lymphatic trunks.

The *superficial* lymphatic glands are placed in the most protected situations of the superficial fascia, as in the hollow of the ham and groin in the lower extremity, and upon the inner side of the arm in the upper extremity. The *deep* lymphaties accompany the deeper veins; those from the lower parts of the body converging to the numerous glands seated around the iliac veins and inferior vena cava, and terminating in a large trunk situated upon the vertebral column—the thoracic duct. From the upper part of the trunk on the left side, and from the left side of the head and neck, they also proceed to the thoracic duct. Those on the right side of the head and neck, right upper extremity, and right side of the thorax, form a distinct duct which terminates at the point of the junction of the subclavian with the internal jugular vein on the right side of the root of the neck.

The *lacteals* are the lymphatics of the small intestines; they have received their distinctive appellation from conveying the milk-like product of digestion—the chyle—to the great centre of the lymphatic system—the thoracic duct. They are situated in the mesentery, and pass through the numerous mesenteric glands in their course.

The communications between lymphatic vessels are less frequent than those of arteries or veins; their anastomoses take place by means of branches of equal calibre that unite at acute angles, and constitute a combined trunk which is scarcely larger than either of the single branches by which it is formed.

Lymphatic vessels are composed of two coats; an external or cellular, and an internal or serous.

The *external coat* resembles the external tunic of veins and arteries, but is extremely thin and dense. The *internal coat* is continuous with the internal lining of the veins; and, like that membrane, is most probably provided with an epithelium. At short intervals this coat forms semilunar folds which are disposed in pairs in the cylinder of the vessel and constitute the valves. It is to these valves which are extremely numerous in lymphatics, that their peculiar knotted appearance is due, when filled with injection.

The lymphatic glands are small oval and somewhat flattened

or rounded bodies, composed of a plexus of minute lymphatic vessels, associated with a plexus of blood-vessels, and enclosed in a thin cellular capsule. The larger glands have a lobed or cellular appearance. The lymphatic vessels and glands are supplied with arteries, veins, and nerves, like other structures.

I shall describe the lymphatic vessels and glands according to the arrangement adopted for the veins, commencing with those of the head and neck, and proceeding next to those of the upper extremity, lower extremity, and trunk.

LYMPHATICS OF THE HEAD AND NECK.

The superficial lymphatic glands of the head and face are small and few in number; they are the occipital, which are situated near the origin of the occipito-frontalis muscle; posterior auricular, behind the ear; parotid, in the parotid gland; zygomatic, in the zygomatic fossa; buccal, upon the buccinator muscle; and submaxillary, beneath the margin of the lower jaw. There are no deep lymphatic glands within the cranium.

The superficial cervical lymphatic glands are few in number; they are situated in the course of the external jugular vein, between the sterno mastoid and trapezius muscles, at the root of the neck and about the larynx.

The deep cervical glands are very uumerous and of large size; they are situated around the internal jugular vein and sheath of the carotid arteries, by the side of the pharynx, œsophagus, and trachea, and extend from the base of the skull to the root of the neck, where they are continuous with the lymphatic vessels and glands of the thorax.

The superficial lymphatic vessels of the head and face are disposed in three groupes; occipital, which takes the course of the occipital vein to the occipital and deep cervical glands; temporal, which follows the branches of the temporal vein to the parotid and deep cervical glands; and facial, which accompanies the facial vein to the submaxillary lymphatic glands.

The deep lymphatic vessels of the head are the meningeal and cerebral; the former are situated in connection with the meningeal veins, and escape through foramina at the base of the scull, to join the deep cervical glands. The cerebral lymphatics, according to Fohmann, are situated upon the surface of the pia mater. They pass most probably through the foramina at the base of the skull, to terminate in the deep cervical glands.

The deep lymphatic vessels of the face proceed from the nasa fossæ, mouth, and pharynx, and terminate in the submaxillary and deep cervical glands.

The superficial and deep cervical lymphatic vessels of the

neck accompany the jugular veins, passing from gland to gland, and at the root of the neck communicate with the thoracic lymphatic vessels, and terminate, on the right side, in the ductus lymphaticus dexter, and, on the left, in the thoracic duct, near to its termination.

LYMPHATICS OF THE UPPER EXTREMITY.

The superficial lymphatic glands of the arm are not more than four or five in number, and of very small size. One or two are situated near the median, basilic, and cephalic veins, at the bend of the elbow ; and one or two near to the basilic vein, on the inner side of the upper arm, immediately above the elbow.

The deep glands in the fore-arm are excessively small and infrequent; two or three may generally be found in the course of theradial and ulnar vessel. In the upper arm there is a chain of small glands, accompanying the brachial artery.

The axillary glands are numerous and of large size. Some are closely adherent to the vessels, some are disposed in the loose cellular tissue of the axilla, and a small chain may be observed extending along the lower border of the pectoralis major to the mammary gland. Two or three subclavian glands are situated beneath the clavicle, and serve as the medium of communication between the axillary and deep carvical lymphatic glands.

The superficial lymphatic vessels of the upper extremity commence at the extremities of the fingers, and pass along the borders of the fingers to the dorsum of the hand ; they next ascend the fore-arm, some on its posterior and some on its anterior aspect, observing particularly the direction of the veins. At the bend of the elbow they converge, to form two groups which accompany the basilic and cephalic veins. The lymphatics of the basilic group communicate with the glands, situated immediately above the elbow, and ascend to join the axillary glands. Those of the cephalic group for the most part cross the upper part of the biceps muscle, and also enter the axilary glands, while two or three are continued onwards along the cephalic vein, in the interspace between the pectoralis major and deltoid muscle, to communicate with the subclavian glands.

The deep lymphatics accompany the vessels of the upper extremity, and communicate occasionally with the superficial lymphatics. They enter the axillary and subclavian glands and, at the root of the neck, terminate on the left side in the thoracic duct, and on the right side in the ductus lymphaticus dexter.

LYMPHATICS OF THE LOWER EXTREMITY.

The superficial lymphatic glands of the lower extremity are those of the groin, the inguinal, and one or two situated in the superficial facia of the posterior aspect of the thigh, just above the popliteal region.

The inguinal glands are divisible into two groups, a superior group of small size, situated along the course of Poupart's ligament, and receiving the lymphatic vessels from the parietes of the abdomen and genital organs; and an inferior group of larger glands clustered around the internal saphenous vein near to its termination, and receiving the superficial lymphatic vessels from the lower extremity.

The deep lymphatic glands are the anterior tibial, popliteal, deep inguinal, gluteal, and ischiatic.

The anterior tibial is generally a single gland, placed on the interosseous membrane, by the side of the anterior tibial artery in the upper part of its course.

The popliteal glands, four or five in number, are embedded in the loose cellular tissue and fat of the popliteal space.

The deep inguinal glands, less numerous and smaller than the superficial, are situated near the femoral vessels in the groin, beneath the fascia lata.

The gluteal and ischiatic glands are placed above and below the pyriformis muscle, at the great ischiatic foramen.

The superficial lymphatic vessels are divisible into two groups, internal and external. The internal and principal group, commencing on the dorsum and inner side of the foot, ascend the leg by the side of the internal saphenous vein, and passing behind the inner condyle of the femur, follow the direction of that vein to the groin, where they join the saphenous group of superficial inguinal glands. The greater part of the efferent vessels from these glands pierce the cribriform fascia of the saphenous opening and the sheath of the femoral vessels to join the lymphatic gland situated in the femoral ring, which serves to establish a communication between the lymphatics of the lower extremity and those of the trunk. The other efferent vessels pierce the fascia lata, to join the deep glands. The vessels which pass upwards from the outer side of the dorsum of the foot, ascend upon the outer side of the leg, and curve inwards just below the knee, to unite with the lymphatics of the inner side of the thigh. The external group consists of a few lymphatic vessels which commence upon the outer side of the foot and posterior part of the ankle, and accompany the external saphenous vein to the popliteal region, where they enter the popliteal glands.

The deep lymphatic vessels accompany the deep veins, and communicate with the various glands in their course. After

joining the deep inguinal glands, they pass beneath Poupart's ligament, to communicate with the numerous glands situated around the iliac vessels. The deep lymphatics of the gluteal region follow the course of the branches of the gluteal and ischiatic arteries. The former join the glands situated upon the upper border of the pyriformis muscle, and the latter, after communicating with the lymphatics of the thigh, enter the ischiatic glands.

LYMPHATICS OF THE TRUNK.

The lymphatics of the trunk may be arranged under three heads—superficial, deep, and visceral.

The superficial lymphatic vessels of the upper half of the trunk pass upwards and outwards on each side, and converge, some to the axillary glands, and others to the glands at the root of the neck. The lymphatics from the mammary glands follow the lower border of the pectoralis major, communicating with a chain of lymphatic glands, to the axillary glands. The superficial lymphatic vessels of the lower half of the trunk, of the gluteal region, perineum, and external organs of generation, converge to the superior group of superficial inguinal glands. Some small glands are situated on each side of the dorsal vein of the penis, from which, as from the superficial lymphatics, the efferent vessels pass into the superior group of superficial inguinal glands.

The deep lymphatic glands of the thorax are the intercostal, internal, mammary, anterior mediastinal, aud posterior mediastinal.

The intercostal glands are of small size, and are situated on each side of the vertebral column, near the articulations of the heads of the ribs, and in the course of the intercostal arteries.

The internal mammary glands, also very small, are placed in the intercostal spaces, by the side of the internal mammary arteries.

The anterior mediastinal glands occupy the loose cellular tissue of the anterior mediastinum, resting some on the diaphragm, but the greater number upon the large vessels at the root of the heart.

The posterior mediastinal glands are situated along the course of the aorta and œsophagus, in the posterior mediastinum, and communicate above with the deep cervical glands, on each side with the intercostal, and below with the abdominal glands.

The deep lymphatic vessels of the thorax are the intercostal, internal mammary, and diaphragmatic.

The intercostal lymphatic vessels follow the course of the

arteries of the same name; and reaching the vertebral column, curve downwards, to terminate in the thoracic duct.

The internal mammary lymphatics commence in the parietes of the abdomen communicating with the epigastric lymphatics.

They ascend by the side of the internal mammary vessels, being joined in their course by the anterior intercostals, and terminate on the right side in the tributaries of the ductus lymphaticus dexter; and on the left side in the thoracic duct. The diaphragmatic lymphatics pursue the direction of the corresponding veins, and terminate, some in front in the internal mammary vessels, and some behind, in the posterior mediastinal lymphatics.

The deep lymphatic glands of the abdomen are the lumbar glands; they are very numerous, and are seated around the common iliac vessels, the aorta and vena cava.

The deep lymphatic glands of the pelvis are the external iliac, internal iliac, and sacral.

The external iliac are placed around the external iliac vessels, being in continuation by one extremity with the femoral lymphatics, and by the other with the lumbar glands.

The internal iliac glands are situated in the course of the internal iliac vessels, and the sacral glands are supported by the concave surface of the sacrum.

The deep lymphatic vessels are continued upwards from the thigh, beneath Poupart's ligament, and along the external iliac vessels to the lumbar glands, receiving in their course the epigastric, circumflex ilii, and ilio-lumbar lymphatic vessels. Those from the parietes of the pelvis, and from the gluteal, ischiatic, and obturator vessels, follow the course of the internal iliac arteries, and unite with the lumbar lymphatics. And the lumbar lymphatic vessels, after receiving all the lymphatics from the lower extremities, pelvis and loins, terminate by several large trunks in the receptaculum chyli.

LYMPHATICS OF THE VISCERA.

The lymphatic vessels of the lungs are distributed over every part of the surface, and through the texture of these organs, and converge to the numerous glands situated around the bifurcation of the trachea and roots of the lungs—the bronchial glands. Some of these glands, of small size, may be traced in connection with the bronchial tubes, for some distance into the lungs. The efferent vessels from the bronchial glands unite with the tracheal and œsophageal glands, and terminate principally in the thoracic duct at the root of the neck, and partly in the ductus lymphaticus dexter. The bronchial glands, in the adult, present a variable tint of brown, and in old age a deep black color. In infancy they have none of this pigment, and

are not to be distinguished from lymphatic glands in other situations.

The lymphatic vessels of the heart originate in the subserous cellular tissue of the surface, and in the deeper tissues of the organ, and follow the course of the vessels, principally, along the right border of the heart to the glands situated around the arch of the aorta and bronchial glands, whence they proceed to the thoracic duct.

The pericardiac and thymic lymphatic vessels proceed to join the anterior mediastinal and bronchial glands.

The lymphatic vessels of the liver are divisible into the deep and superficial. The former take their course through the portal canals, and through the right border of the lesser omentum, to the lymphatic glands, situated in the course of the hepatic artery and along the lesser curve of the stomach. The superficial lymphatics are situated in the cellular structure of the proper capsule, over the whole surface of the liver. Those of the convex surface are divided into two sets—1. those which pass from before backwards; 2. those which advance from behind forwards. The former unite to form trunks, which enter between the folds of the lateral ligaments at the right and left extremities of the organ, and of the coronary ligament in the middle. Some of these pierce the diaphragm and join the posterior mediastinal glands, others converge to the lymphatic glands situated around the inferior cava. Those which pass from behind forwards consist of two groups; one ascends between the folds of the broad ligament, and perforates the diaphragm, to terminate in the anterior mediastinal glands; the other curves around the anterior margin of the liver, to its concave surface, and from thence to the glands in the right border of the lesser omentum. The lymphatic vessels of the concave surface are variously distributed, according to their position; those from the right lobe terminate in the lumbar glands; those from the gall bladder, which are large and form a remarkable plexus, enter the glands in the right border of the lesser omentum; and those from the left lobe converge to the lymphatic glands situated along the lesser curve of the stomach.

The lymphatic glands of the spleen are situated around its hilus, and those of the pancreas in the course of the splenic vein. The lymphatic vessels of these organs pass through their respective glands, and join the aortic glands, previously to terminating in the thoracic duct.

The lymphatic glands of the stomach are of small size, and situated along the lesser and greater curves of that organ. The lymphatic vessels, as in other viscera, are superficial and deep; the former originating in the subserous, and the latter in the submucous tissue; they pass from the stomach in four different

directions: some ascend to the glands situated along the lesser curve, others descend to those occupying the greater curve, a third set passes outwards to the splenic glands, and a fourth to the glands situated near the pylorus and aortic glands.

The lymphatic glands of the small intestine are situated between the layers of the mesentery, in the meshes formed by the superior mesenteric artery, and thence named mesenteric glands. These glands are most numerous and largest, superiorly, near the duodenum; and inferiorly, near the termination of the ileum.

The lymphatic vessels of the small intestines are of two kinds—those of the structure of the intestines, which ramify upon its surface previously to entering the mesenteric glands, and those which commence in the villi, upon the surface of the mucous membrane, and are named lacteals.

The lacteals, according to the most recent and best researches, commence in the centre of each villus as a blind tubulus, which opens into a fine network, situated in the submucous tissue. From this areolar network the lacteal vessels proceed to the mesenteric glands, and from thence to the thoracic duct, in which they terminate.

The lymphatic glands of the large intestines are situated along the attached margin of the intestine, in the meshes formed by the arteries previously to their distribution. The lymphatic vessels take their course in two different directions, those of the cæcum, ascending and transverse colon, after traversing their proper glands, proceed to the mesenteric, and those of the descending colon and rectum to the lumbar glands.

The lymphatic vessels of the kidney follow the direction of the blood vessels to the lumbar ganglia situated around the aorta and inferior vena cava; those of the supra-renal capsules, which are very large and numerous, terminate in the renal lymphatics.

The lymphatic vessels of the viscera of the pelvis terminate in the sacral and lumbar ganglia.

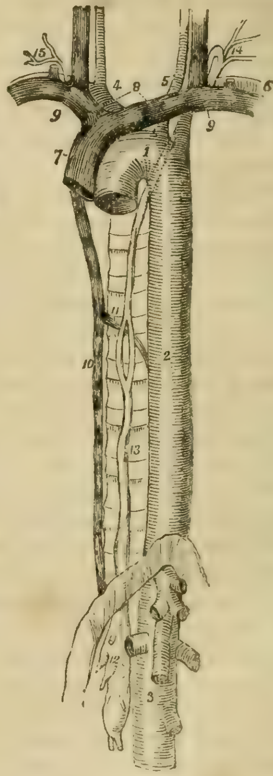
The lymphatic vessels of the testicle take the course of the spermatic cord, where they are of large size, and terminate in the lumbar ganglia.

THORACIC DUCT.

The thoracic duct commences in the abdomen, by a considerable and somewhat triangular dilatation, the receptaculum chyli, which is situated upon the front of the body of the second lumbar vertebra, behind and between the aorta and inferior vena cava, and close to the tendon of the right crus of the diaphragm. From the upper part of the receptaculum chyli the thoracic duct ascends through the aortic opening in the dia-

phragm, and along the front of the vertebral column, lying between the thoracic aorta and vena azygos, to the fourth dorsal vertebra. It then inclines to the left side, passes behind the arch of the aorta, and ascends by the side of the œsophagus and behind the perpendicular portion of the left subclavian artery to the root of the neck opposite the seventh cervical vertebra, where it makes a sudden curve forwards and downwards, and terminates at the point of junction of the left subclavian with the left internal jugular vein.

PLATE 81.*



The thoracic duct is equal in size to the diameter of a goose-quill at its commencement from the receptaculum chyli, diminishes considerably in diameter towards the middle of the posterior mediastinum, and again becomes dilated near its termination. At about the middle of its course it frequently divides into two branches of equal size, which reunite after a short course; and sometimes it gives off several branches, which assume a plexiform arrangment in this situation. Occasionally the thoracic duct bifurcates at the upper part of the thorax into

* *The Course and Termination of the Thoracic Duct.*—1. The arch of the aorta. 2. The thoracic aorta. 3. The abdominal aorta, showing its principal branches divided near their origin. 4. The arteria innominata, dividing into the right carotid and right subclavian arteries. 5. The left carotid. 6. The left subclavian. 7. The superior cava, formed by the union of 8, the two vena innominatæ; and these by the junction 9, of the internal jugular and subclavian vein at each side. 10. The greater vena azygos. 11. The termination of the lesser in the greater vena azygos. 12. The receptaculum chyli; several lymphatic trunks are seen opening into it. 13. The thoracic duct, dividing opposite the middle of the dorsal vertebræ into two branches, which soon reunite. The course of the duct behind the arch of the aorta and left subclavian artery is shown by a dotted line. 14. The duct making its turn at the root of the neck, and reeeiving several lymphatic trunks previously to terminating in the posterior aspect of the junction of the internal jugular and subclavian vein. 15. The termination of the trunk of the ductus lymphaticus dexter.

two branches, one of which opens into the point of junction between the right subclavian and jugular veins, while the other proceeds to the normal termination of the duct on the left side. In rare instances the duct has been found to terminate in the vena azygos, which is the normal destination in some mammalia.

The thoracic duct presents fewer valves in its course than lymphatic vessels generally; at its termination it is provided with a pair of semilunar valves, which prevent the admission of venous blood into its cylinder.

Branches.—The thoracic duct receives at its commencement four or five large lymphatic trunks which unite to form the receptaculum chyli; it next receives the trunks of the lacteal vessels. Within the thorax it is joined by a large lymphatic trunk from the liver, and in its course through the posterior mediastinum receives the lymphatic vessels both from the viscera and from the parietes of the thorax. At its curve forwards in the neck it is joined by the lymphatic trunks from the left side of the head and neck, left upper extremity, and from the upper part of the thorax, and thoracic viscera.

The ductus lymphaticus dexter is a short trunk, which receives the lymphatic vessels from the right side of the head and neck, right upper extremity and right side of the thorax, and terminates at the junction of the right subclavian with the right internal jugular vein, at the point where these veins unite to form the right vena innominata. It is provided at its termination with a pair of semilunar valves which prevent the entranee of blood from the veins.

ON THE NERVOUS SYSTEM.

The *nervous system* consists of a central organ, the cerebro-spinal centre or axis, and of numerous rounded and flattened white cords, the nerves, which are connected by one extremity with the cerebro-spinal centre, and by the other are distributed to all the textures of the body. The sympathetic system is an exception to this description; for in place of one, it has many small centres, which are called ganglia, and which communicate very freely with the cerebro-spinal axis, and with its nerves.

The cerebro-spinal axis consists of two portions—the brain, an organ of large size, situated within the skull, and the spinal cord, a lengthened portion of the nervous centre continuous with the brain, and occupying the canal of the vertebral column.

The most superficial examination of the brain and spinal cord shows them to be composed of fibres, which in some situations are ranged side by side or collected into bundles, and in

other situations are interlaced at various angles by cross fibres. The fibres are collected and held together by a delicate cellular web, which forms the bond of support to the entire organ. It is also observed that the cerebro-spinal axis presents two substances differing from each other in density and color—a grey or cineritious or cortical substance, and a white or medullary substance. The grey substance forms a thin lamella over the entire surface of the convolutions of the cerebrum, and the laminæ of the cerebellum: hence it has been named cortical; but it is likewise situated in the centre of the spinal cord its entire length, and may thence be traced through the medulla oblongata, crura cerebri, thalami optici, and corpora striata; it enters also into the composition of the locus perforatus, tuber cinereum, commissura molils, pineal gland, and corpus rhomboideum.

The fibres of the cerebro-spinal axis are arranged into two classes, diverging and converging. The diverging fibres proceed from the medulla oblongata, and diverge to every part of the surface of the brain; while the converging commence upon the surface, and proceed inwards towards the centre, so as to connect the diverging fibres of opposite sides. In certain parts of their course the diverging fibres are separated by the grey substance, and increase in number so as to form a body of considerable size, which is called a ganglion. The position and mutual relations of these fibres and ganglia may be best explained by reference to the mode of developement of the cerebro-spiral axis in animals and in man.

The centre of the nervous system in the lowest animals possessed of a lengthened axis, presents itself in the form of a double cord. A step higher in the animal scale, and knots or ganglia are developed upon one extremity of this cord; such is the most rudimentary condition of the brain in the lowest forms of vertebrata. In the lowest fishes, the anterior extremity of the double cord displays a succession of five pairs of ganglia. The higher fishes and amphibia appear to have a different disposition of these primitive ganglia. The first two have become fused into a single ganglion, and then follow only three pairs of symmetrical ganglia. But if the larger pair be unfolded after being hardened in alcohol, it will then be seen that the whole number of ganglia exists, but that four have become concealed by a thin covering that has spread across them. This condition of the brain carries us upwards in the animal scale even to mammalia; *i. e.*, in the dog or cat we find, first a single ganglion, the cerebellum, then three pairs following each other in succession; and if we unfold the middle pair, we shall be at once convinced that it is indeed composed of two pairs of primitive ganglia concealed by an additional developement. Again

it will be observed, that the primitive ganglia of opposite sides, at first separate and disjoined, become connected by means of transverse fibres of communication (commissures, commissura). The office of these commissures is the association in function of the two symmetrical portions. Hence we arrive at the general and important conclusion, that the brain among the lower animals consists of primitive cords, primitive ganglia upon those cords, and commissures which connect the substances of the adjoining ganglia, and associate their actions.

In the developement of the cerebro-spinal axis in man, the earliest indication of the spinal cord is presented under the form of a pair of minute longitudinal filaments placed side by side. Upon these, towards the anterior extrenity, five pairs of minute swellings are observed, not disposed in a straight line as in fishes, but curved upon each other so as to correspond with the direction of the future cranium. The posterior pair soon becomes cemented upon the middle line, forming a single ganglion; the second pair also unite with each other; the third and fourth pairs, at first distinct, are speedily veiled by a lateral developement, which arches backwards and conceals them; the anterior pairs, at first very small, decrease in size and become almost lost in the increased developement of the preceding pairs.

We see here a chain of resemblances corresponding with the progressive developement observed in the lower animals; the human brain is passing through the phases of improving developement, which distinguishes the lowest from the lower creatures; and we are naturally led to the same conclusion with regard to the architecture of the human brain, that we were led to establish as the principle of developement in the inferior creatures—that it is composed of primitive cords, primitive ganglia upon those cords, commissures to connect those ganglia, and developements from those ganglia.

In the adult, the primitive longitudinal cords have become cemented together, to form the spinal cord. But at the upper extremity they separate from each other, under the name of crura cerebri. The first pair of ganglia developed from the primitive cords, have grown into the cerebellum; the second pair (the optic lobes of animals) have become the corpora quadrigemina of man. The third pair (the optic thalami), and the fourth (the corpora striata), are the basis of the hemispheres, which, the merest lamina in the fish, has become the largest portion of the brain of man. And the fifth pair (olfactory lobes) so large in the lowest forms, has dwindled into the olfactory bulbs of man.

The white substance of the brain and spinal cord, examined with the microscope, is found to consist of fibres varying in diameter from the 370th to the 184th of a line. These fibres are

composed of a thin and transparent neurilema, enclosing a soft homogenous nervous substance, and they possess a remarkable tendency, when compressed, to assume a varicose appearance. The nervous fibres of the olfactory, optic, and auditory nerves, have the same disposition to become varicose on pressure. The neurilema of the primitive fibre, according to Fontana, consists of two layers, of which the internal is thin and transparent, and the external cellular and less transparent.

The grey substance of the brain, according to Valentin, is composed of globules of considerable size, having a central nucleus, near the margin of which is another smaller nucleus, and frequently upon the surface of the globule, patches of pigment. The various shades of grey observed in different parts of the brain depend upon the greater or smaller number of globules existing in those parts. Two kinds of grey substance are described as existing in the spinal cord ; the one is the ordinary grey matter of the cord, and the other forms part of the posterior cornua. The former resembles the grey matter of the brain, consisting of globules, while the latter is composed of small bodies resembling the blood corpuscules of the frog.

The nerves are divisible into two great classes—those which proceed directly from the cerebro-spinal axis, the cranial and spinal nerves, and constitute the system of animal life ; and those which originate from a system of nervous centres, independent of the cerebro-spinal axis, but closely associated with that centre by numerous communications, the sympathetic system, or system of organic life.

The division of nerves into cranial and spinal is purely arbitrary, and depends upon the circumstance of the former passing through the foramina of the cranium, and the latter through those of the vertebral column. With respect to origin, all the cranial nerves, with the exception of the first (olfactory), proceed from the spinal cord, or from its immediate continuation into the brain. The spinal nerves arise by two roots—anterior, which proceeds from the anterior segment of the spinal cord, and possesses a motor function—and posterior, which is connected with the posterior segment, and bestows the faculty of sensation. The motor nerves of the cranium are shown by dissection to be continuous with the motor portion of the cord, and form one system with the motor roots of the spinal cord ; while the nerves of sensation, always excepting the olfactory, are in like manner traced to the posterior segment of the cord, and form part of the system of sensation.

To these two systems a third has been added by sir Charles Bell—the respiratory system—which consists of nerves associated in the function of respiration, and arising from the side of the upper part of the spinal cord in one continuous line, which

was thence named, by that distinguished physiologist, the respiratory tract.

Recent researches have made an important addition to our knowledge of the mode of connection of the nerves with the spinal cord, and shown that both roots of the spinal nerves, as well as most of the cerebral, divide into two sets of filaments upon entering the cord, one set being connected to the grey substance, while the other is continuous with the white or fibrous part of the cord.

The connection of a nerve with the cerebro-spinal axis is called, for the convenience of description, its origin; this term must not, however, be received literally, for each nerve is developed in the precise situation which it occupies in the body, and with the same relations that it possesses in after life. Indeed, we not unfrequently meet with instances in anencephalous fœtuses, where the nerves are beautifully and completely formed, while the brain and spinal cord are wholly wanting. The word origin must, therefore, be considered as a relict of the darkness of preceding ages, when the cerebro-spinal axis was looked upon as the tree from which the nerves pushed forth as branches. In their distribution, the spinal nerves for the most part follow the course of the arteries, particularly in the limbs, where they lie almost constantly to the outer side and superficially to the vessels, as if for receiving the first intimation of danger, and communicating it to the muscles, that they may instantly remove the arteries from impending injury.

A microscopic examination of a cerebro-spinal nerve shows it to be composed of minute fibres resembling those of the brain, and consisting of a neurilema enclosing a soft homogenous nervous substance. The chief difference between the fibres of the nerves and the cerebral fibres, is a somewhat greater opacity and more granular appearance of the contents of the minute cylinders of the former; a greater thichness of their neurilema, and an indisposition to the formation of varicose enlargements upon compression. The neurilema presents the same two layers which exist in the cerebral fibres. The primitive fibres, or filaments, are assembled into small bundles and enclosed in a distinct sheath, constituting a funiculus; the funiculi are collected into larger bundles, or fasciculi, and a single or a number of fasciculi connected by cellular tissue, and invested by a membranous sheath, constitute a nerve. The funiculi, when freshly exposed, present a peculiar zigzag line across their cylinder, which is most probably produced by the arrangement of the primitive fibres, or possibly by some condition of the neurilema. This appearance is destroyed by making extension upon the nerve.

Communications between nerves take place either by means

of the funiculi composing a single nerve, or of the fasciculi in a nervous plexus. In these communications, there is no fusion of nervous substance, the cord formed by any two funiculi is constantly enlarged, and corresponds accurately with their combined bulk.

A nervous plexus consists in a communication between the fasciculi and funiculi composing the nerves which are associated in their supply of a limb or of a certain region of the body. During this communication there is an interchange of funiculi, and with the funiculi an interchange of fibres.

The sympathetic system consists of numerous ganglia, of communicating branches passing between the ganglia, of others passing between the ganglia and the cerebro-spinal axis, and of branches of distribution which are remarkable for their frequent and plexiform communications. The sympathetic nerves also differ from other nerves in their color, which is of a greyish pearly tint. Examined with the microscope, the sympathetic nerves are seen to be composed of an admixture of grey and white fibres. The grey are much smaller than the white, less transparent, and the neurilema is less easily distinguishable from its contents. Some of the nerves are composed of grey fibres only, without any admixture of white. The sympathetic ganglia contain the globules observed in the grey substance of the brain; they are firmer in structure and enclosed in a strong investing capsule. The fasciculi of fibres entering the ganglion become divided and form a plexus around the globules, and then converge to constitute another fasciculus, by which they quit the ganglion.

The nervous system may be divided, for convenience of description, into—1. The brain. 2. The spinal cord. 3. The cranial nerves. 4. The spinal nerves. 5. The sympathetic system.

THE BRAIN.

The *brain* is a collective term, which signifies those parts of the nervous system exclusive of the nerves themselves which are contained within the cranium; they are the cerebrum, cerebellum, and medulla oblongata. These are invested and protected by the membranes of the brain, and the whole together constitute the encephalon.

Dissection.—To examine the *encephalon* with its *membranes*, the upper part of the skull must be removed by sawing through the external table, and breaking the internal table with the chisel and hammer. After the calvarium has been loosened all round it will require a considerable degree of force to tear the bone away from the dura mater. The adhesion is particu-

larly firm at the sutures, where the dura mater is continuous with a membranous layer interposed between the edges of the bones; in other situations, the connection results from numerous vessels which permeate the inner table of the skull. The adhesion subsisting between the dura mater and bone is greater in the young subject than in the adult.

Upon being torn away, the internal table will present the deeply grooved and ramified channels, corresponding with the branches of the arteria meningea media. Along the middle line will be seen a groove corresponding with the superior longitudinal sinus, and on either side may be frequently observed some depressed fossæ, corresponding with the Pacchionian bodies.

The membranes of the encephalon are, the *dura mater*, *arachnoid membrane*, and *pia mater*.

DURA MATER.

The *dura mater* (so named from a supposition that it was the source of all the fibrous membranes of the body), is the firm, bluish, fibrous membrane, which is exposed on the removal of the calvarium. It lines the interior of the skull and spinal column, and sends processes inwards, for the support and protection of the different parts of the brain. It also sends processes externally, which form sheaths for the nerves as they quit the skull and spinal column. Its external surface is rough and fibrous, and corresponds with the internal table of the skull. The internal surface is smooth, and lined by the thin varnish-like lamella of the arachnoid membrane. The latter is a serous membrane. Hence the dura mater becomes a fibro-serous membrane, being composed of its own proper fibrous structure, and the serous layer derived from the arachnoid.

The *glandulæ Pacchioni* are small, round, whitish granulations, collected in clusters of variable size. They are found in three situations. 1. On the inner surface of the dura mater, near the superior longitudinal sinus; when of large size they produce absorption of the dura mater, and considerable indentations of the inner wall of the skull. 2. In the superior longitudinal sinus. 3. On the arachnoid membrane, investing the pia mater near to the margin of the hemispheres.

If the student cut through one side of the dura mater, and turn it upwards towards the middle line, he will observe the smooth internal surface of the dura mater. He will perceive also the large cerebral veins filled with dark blood, passing from behind forwards to open into the superior longitudinal sinus, and the firm connections by means of these veins and the Pacchionian bodies between the opposed surfaces of the arachnoid membrane.

If he separate these with his scalpel, he will see a vertical layer of dura mater descending between the hemispheres, and if he draw one side of the brain a little outwards, he will distinctly perceive its extent. This is the falx cerebri.

The processes of dura mater which are sent inwards towards the interior of the skull, are the falx cerebri, tentorium cerebelli, and falx cerebelli.

The *arteries* of the dura mater are—the

Anterior meningeal, from the internal carotid.

Middle meningeal and meningea parva, from the internal maxillary.

Inferior meningeal, from the ascending pharyngeal and occipital arteries.

Posterior meningeal, from the vertebral.

The *nerves* are derived from the nervi molles and vertebral plexus of the sympathetic, from the Casserian ganglion, the opthalmic nerve, and sometimes from the fourth. The branches from the two last are given off while the nerves are situated by the side of the sella turcea; they are recurrent, and pass backwards between the layers of the tentorium, to the lining membrane of the lateral sinus.

Arachnoid Membrane.

The arachnoid, so named from its extreme tenuity, is the serous membrane of the cerebro-spinal centre, and, like other serous membranes, a shut sac. It envelopes the vein and spinal cord, and is reflected upon the inner surface of the dura mater, giving to that membrane its serous investment.

The arachnoid is attached to the surface of the pia mater by a loose cellular tissue, the sub-arachnoidean. This tissue is filamentous at the base of the brain, between the hemispheres, and around the spinal cord, where the arachnoid is disposed very loosely.

The sub-arachnoidean cellular tissue is the seat of an abundant serous secretion, the sub-arachnoidean fluid, which fills all the vacuities existing between the arachnoid and pia mater, and distends the arachnoid of the spinal cord so completely, as to enable it to occupy the whole of the space included in the sheath of dura mater.

The arachnoid also secretes a serous fluid from its inner surface, which is small in quantity compared with the sub-arachnoidean liquid.

Pia Mater.

The pia mater is a vascular membrane, composed of innumerable vessels held together by a thin cellular layer. It invests the whole surface of the brain, dipping into its convolu-

tions, and forming a fold in its interior, called velum interpositum. It also forms folds in other situations, as in the fourth ventricle, and in the longitudinal grooves of the spinal cord.

The pia mater is the nutrient membrane of the brain, and derives its blood from the internal carotid and vertebral arteries.

Its *nerves* are the minute filaments of the sympathetic, which accompany the branches of the arteries.

CEREBRUM.

The cerebrum is divided into two hemispheres by the great longitudinal fissure, which lodges the falx cerebri, and marks the original developement of the brain by two symmetrical halves.

Each hemisphere, upon its under surface, admits of a division into three lobes, anterior, middle, and posterior. The anterior lobe rests upon the roof of the orbit, and is separated from the middle by the fissure of Sylvius. The middle lobe is received into the middle fossa, in the base of the skull, and is separated from the posterior by a slight impression produced by the ridge of the petrous bone. The posterior lobe is supported by the tentorium.

Separate carefully the two hemispheres of the cerebrum, and a broad band of white substance will be seen to connect them. Remove the upper part of each hemisphere, with a knife, to a level with this white layer, and the appearance resulting from this section is the centrum ovale majus.

The centrum ovale majus is surrounded by a thin stratum of grey substance, which follows in a zigzag line all the convolutions and the fissures between them. In the middle of the centum ovale majus is the broad band which connects the two hemispheres to each other, the corpus callosum.

If an incision be made through the corpus callosum on either side of the raphe, two irregular cavities will be opened, which extend from one extremity of the hemispheres to the other; these are the lateral ventricles. To expose them completely, the upper boundary should be removed with the scissors.

Each lateral ventricle is divided into a central cavity, and and three smaller cavities called cornua. The anterior cornu curves forwards and outwards in the anterior lobe; the middle cornu descends into the middle lobe; and the posterior cornu passes backwards in the posterior lobe, converging towards its fellow of the opposite side. The central cavity is triangular in its form, bounded above by the corpus callosum; internally by the septum lucidum, which separates it from the opposite ventricle; and below by the following parts, taken in their order of position from before backwards:—Corpus striatum, tenia se-

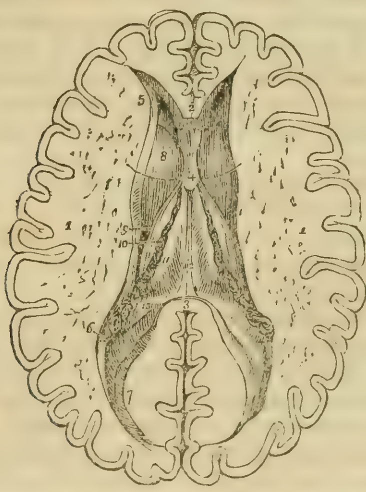
micircularis, thalamus opticus, choroid plexus, corpus fimbriatum, fornix.

The foramen of Monro may be distinctly seen by pulling slightly on the choroid plexus, and pressing aside the septum lucidum with the handle of the knife. It is situated between the under surface of the fornix, and the anterior extremities of the thalami optici, and forms a transverse communication between the lateral ventricles, and below with the third ventricle.

The fornix is a white layer of medullary substance, of which a portion only is seen in this view of the ventricle.

The anterior cornu is triangular in its form, sweeping outwards, and terminating by a point in the anterior lobe of the brain, at a short distance only from its surface.

PLATE 82*.



* *The Lateral Ventricles of the Cerebrum.*—1, 1. The two hemispheres, cut down to a level with the corpus callosum so as to constitute the centrum ovale majus. The surface is seen to be studded with the small vascular points—puncta vasculosa—and surrounded by a narrow margin which represents the grey substance. 2. A small portion of the anterior extremity of the corpus callosum. 3. Its posterior boundary; the intermediate portion forming the roof of the lateral ventricles has been removed, so as to completely expose those cavities. 4. A part of the septum lucidum, showing an interspace between its layers—the fifth ventricle. 5 The anterior cornu of one side. 6. The commencement of the middle cornu. 7. The posterior cornu. 8. The corpus striatum of one ventricle. 9. The tenia semicircularis covered by the vena corporis striati and tenia Tarini. 10. A small part of the thalamus opticus. 11. The choroid plexus. This plexus communicates with that of the opposite ventricle through the foramen of Monro; a bristle is passed through this opening, and its extremities are seen resting on the corpus striatum at each side. 12. The fornix. 13. The commencement of the hippocampus major descending into the middle cornu. 14. The hippocampus minor.

The posterior cornu, or digital cavity, curves inwards as it extends into the posterior lobe of the brain, and likewise terminates near to the surface. An elevation corresponding with a deep sulcus between two convolutions, projects into the floor of this cornu, and is called hippocampus minor.

The middle, or descending cornu, in descending into the middle lobe of the brain, forms a very considerable curve, and alters its direction several times as it proceeds. Hence it is described as passing backwards and outwards and downwards, and then turning forwards and inwards. It is the largest of the three cornua.

The middle cornu should now be laid open, by inserting the little finger into its cavity, and making it serve as a director for the scalpel in cutting away the side of the hemisphere, so as to expose it completely.

Its superior boundary is formed by the under surface of the thalamus opticus, upon which are the two projections called corpus geniculatum internum and externum, and the inferior wall, by the various parts which are often spoken of as the contents of the middle cornu: these are—the hippocampus major, pes hippocampi, pes accessorius, corpus fimbriatum, choroid plexus, fascia dentata, and transverse fissure.

Beneath the corpus fimbriatum will be likewise seen the transverse fissure of the brain. It is through this fissure that the pia mater communicates with the choroid plexus, and the latter obtains its supply of blood. This fissure is bounded on one side by the corpus fimbriatum, and on the other by the under surface of the thalamus opticus.

The internal boundary of the lateral ventricle is the septum lucidum. This septum is thin and semi-transparent, and consists of two laminæ of cerebral substance, attached above to the under surface of the corpus callosum at its anterior part, and below to the fornix. Between the two layers is a narrow space, the fifth ventricle, which is lined by a proper membrane.

Beneath the fornix, is the velum interpositum, a reflection of the pia mater introduced into the interior of the brain through the transverse fissure. The velum is connected at each side with the choroid plexus, and contains within its two layers two large veins, the venæ Galeni, which receive the blood from the ventricles, and terminate posteriorly in the straight sinus. Upon the under surface of the velum interpositum are two fringe-like bodies, which project into the third ventricle. These are the choroid plexuses of the third ventricle.

If the velum interpositum be raised and turned back—an operation which must be conducted with care, particularly at its posterior part, where it invests the pineal gland—the thalami optici and the cavity of the third ventricle will be exposed.

The third ventricle is the fissure between the thalami optici and corpora striata.

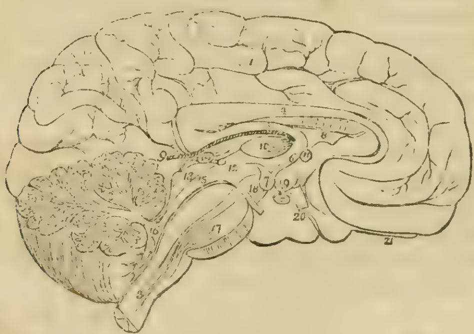
It is crossed by three commissures, the anterior, middle, and posterior; and between these are two spaces, called foramen commune anterius and foramen commune posterius.

Behind the third ventricle is placed the quadrifid ganglion called optic lobes in the inferior animals, and corpora quadrigemina in man. The two anterior of these bodies are the larger, and are named nates; the two posterior, testes.

Behind the corpora quadrigemina is the cerebellum, and beneath the cerebellum, the fourth ventricle, The student must therefore divide the cerebellum down to the fourth ventricle, and turn its lobes aside to examine that cavity.

The fourth ventricle is the ventricle of the medulla oblongata, upon the posterior surface of which it is placed. It is an

PLATE 83.*



* *The Mesial Surface of a Longitudinal Section of the Brain.*—The incision has been carried along the middle line; between the two hemispheres of the cerebrum, and through the middle of the cerebellum and medulla oblongata. 1. The inner surface of the left hemisphere. 2. The divided surface of the cerebellum, showing the arbor vitæ. 3. The medulla oblongata. 4. The corpus callosum, rounded before to terminate in the base of the brain, and behind, to become continuous with 5, the fornix. 6. One of the crura of the fornix descending to 7, one of the corpora albicantia. 8. The septum lucidum. 9. The velum interpositum, communicating with the pia mater of the convolutions through the fissure of Bichat. 10. Section of the middle commissure situated in the third ventricle. 11. Section of the anterior commissure. 12. Section of the posterior commissure. The interspace between 10 and 11 is the foramen commune anterius, in which the crus of the fornix (6) is situated. The interspace between 10 and 12 is the foramen commune posterius. 13. The corpora quadrigemina, upon which is seen resting the pineal gland, 14. 15. The iter a tertio ad quartum ventriculum. 16. The fourth ventricle. 17. The pons Varolii, through which are seen passing the diverging fibres of the corpora pyramidalia. 18. The crus cerebri of the left side, with the third nerve arising from it. 19. The tuber cinerum, from which projects the infundibulum, having the pituitary gland appended to its extremity. 20. One of the optic nerves. 21. The left olfactory nerve, terminating anteriorly in a rounded bulb.

oblong quadrilateral cavity, bounded on each side by a thick cord passing between the cerebellum and corpora quadrigemina, called the processus e cerebello ad testes, and by the corpus restiforme. It is covered in behind by the arch of the cerebellum, which forms three remarkable projections in its cavity, named, from their resemblance, uvula and tonsils; and by a thin lamella of white substance, stretched between the two processes e cerebello ad testes, termed the valve of Vieussens.

We observe within the fourth ventricle, the choroid plexuses, the calamus scriptorius, and lineæ transversæ.

LINING MEMBRANE OF THE VENTRICLES.

The lining membrane of the ventricles is a serous layer, quite distinct from the arachnoid, and having no communication with it. This membrane lines the whole of the interior of the lateral ventricles, and is connected above and below to the attached border of the choroid plexus, so as to exclude completely all communication between the ventricles and the exterior of the brain. It is reflected through the foramen of Monro on each side into the third ventricle, which it invests throughout. From the third it is conducted into the fourth ventricle, through the iter a tertio ad quartum ventriculum, and lines its interior, together with the layer of pia mater which forms its inferior boundary. In this manner a perfect communication is established between all the ventricles, with the exception of the fifth, which has its own proper membrane. It is this membrane which gives them their polished surface, and transudes the secretion which moistens their interior.

CEREBELLUM.

The cerebellum, according to Cruveilheir, is seven times smaller than the cerebrum. Like that organ, it is composed of white and grey substance, whereof the grey is larger in proportion than the white. Its surface is formed by parallel lamellæ, separated by fissures; and at intervals deeper fissures exist, which divide it into larger segments, termed lobules. The cerebellum is divided into two lateral hemispheres, or lobes, two minor lobes, called superior and inferior vermiform processes, and some small lobules.

When cut into vertically, the cerebellum presents the appearance termed arbor vitæ. If the incision be made through the outer third of the organ, a grey body, surrounded by a yellow zigzag line of horny structure, will be seen in the centre of the white substance; this is the corpus rhomboideum, or ganglion of the cerebellum.

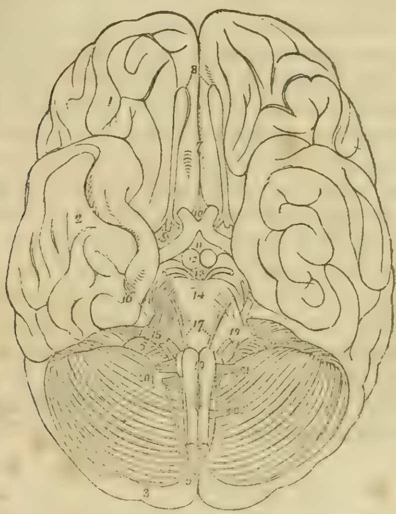
The cerebellum is associated with the spinal cord and cere-

brum by three pairs of peduncles—the corpora restiformia, processus e cerebello ad testes, and crura cerebelli.

BASE OF THE BRAIN.

The student should now prepare to study the base of the brain. For this purpose, the organ should be turned upon its incised surface; and if the dissection has hitherto been conducted with care, he will find the base perfectly uninjured. The araehnoid membrane, some parts of the pia mater, and the

PLATE 84.*



* *The Under Surface or Base of the Brain.*—1. The anterior lobe of one hemisphere of the cerebrum. 2. The middle lobe. 3. Tbe posterior lobe, almost concealed by 4, the lateral lobe of the cerebellum. 5. The inferior vermiform process of the cerebellum. 6. The pneumogastric lobule. 7. The longitudinal fissure. 8. The olfactory nerves, forming their bulbous expansions. 9. The substantia perforata at the inner termination of the fissure of Sylvius; the three roots of the olfactory nerve are seen upon the substantia perforata. The commencement of the transverse fissure on each side is concealed by the inner border of the middle lobe 10. The commissure of the optic nerves. 11. The tuber cinerum, from which the infundibulum is seen projecting. 12 The corpora albicantia. 13. The locus perforatus, bounded on each side by the crura cerebri, and by the third nerve. 14. The pons Varolii. 15. The crus cerebelli of one side. 16. The fifth nerve emerging from the anterior border of the crus cerebelli; the small nerve by its side is the fourth. 17. The sixth pair of nerves. 18. The seventh pair of nerves, consisting of the auditory and facial. 19. The corpora pyramidalia of the medulla oblongata; the corpus olivare and part of the corpus restiforme is seen at each side. Just below the number is the decussation of the fibres of the corpora pyramidalia. 20. The eighth pair of nerves. 21. The ninth or lingual nerve. 22. The anterior root of the first cervical spinal nerve.

circle of Willis, must be carefully cleared away, in order to expose all the structures. These he will find arranged in the following order, from before backwards:

Longitudinal fissure, olfactory nerves, fissure of Sylvius, substantia perforata, commencement of the transverse fissure, optic commissure, tuber cinereum, infundibulum, corpora albicantia, locus perforatus, crura cerebri, pons varolii, crura cerebelli, medulla oblongata.

On each side of the longitudinal fissure, upon the under surface of each anterior lobe, is the olfactory nerve, with its bulb.

Passing backwards on each side beneath the edge of the middle lobe, is the commencement of the great transverse fissure,

PLATE 85.*

* *The Base of the Brain*—upon which several sections have been made, showing the distribution of the diverging fibres.—1. The medulla oblongata. 2. One half of the pons Varolii. 3. The crus cerebri, crossed by the optic nerve, (4), and spreading out into the substance of the middle lobe. 5. The two roots of the optic nerve; the nerves about the crus cerebri and cerebelli are the same as in the preceding figure. 6. The olfactory nerve. 7. The corpora albicantia. On the right side a portion of the brain has been removed, to show the distribution of the diverging fibres. 8. The fibres of the corpus pyramidale passing through the substance of the pons Varolii. 9. The fibres passing through the thalamus opticus. 10. The fibres passing through the corpus striatum. 11. Their distribution to the hemispheres. 12. The fifth nerve; its two roots may be traced, the one forwards to the fibres of the corpus pyramidale, the other backwards to the corpus restiforme. 13. The fibres of the corpus pyramidale which pass outwards with the corpus restiforme into the substance of the cerebellum; these are the arciform fibres of Solly. 14. A section through one of the lateral lobes of the cerebellum, showing the corpus rhomboideum in the centre of its white substance; the arbor vitæ is also beautifully seen. 15. The opposite lobe of the cerebellum.

which extends beneath the hemispheres to the same point on the opposite side.

The *pons Varolii* is the commissure of the cerebellum, and associates the two lateral lobes in their common function. Resting upon the pons, near its posterior border, is the sixth pair of nerves. On the anterior border of the crus cerebelli, at each side, is the thick bundle of filaments belonging to the fifth nerve, and, lying on its posterior border, the seventh pair of nerves.

Externally to the corpora pyramidalia, are two oblong and rounded bodies, supposed to resemble olives in their form, and hence called corpora olivaria. This is the ganglion of the corpus olivare.

Behind the corpus olivare is a narrow white band which descends along the side of the medulla oblongata to the bottom of the lateral sulcus. This is the situation of the respiratory tract of sir Charles Bell.

In addition to the diverging fibres which constitute both the cerebrum and cerebellum, by their increase and developement, another set of fibres are found to exist, which have for their office the association of the symmetrical halves, and distant parts of the same hemisphere.

These are called from their direction, converging fibres, and from their office, commissures. They are—the corpus callosum, fornix, septum lucidum, the anterior, middle and posterior commissures, peduncles of the pineal gland, processus e cerebello ad testes, valve of Vieussens, and pons Varolii.

SPINAL CORD.

The dissection of the spinal cord requires that the spinal column should be opened throughout its entire length, by sawing through the laminæ of the vertebræ, close to the roots of the transverse processes, and raising the arches with a chisel, after the muscles of the back have been removed.

The spinal column contains the spinal cord, or medulla spinalis, the roots of the spinal nerves, and the membranes of the cord, viz. dura mater, arachnoid, pia mater, and membrana dentata.

In form, the spinal cord is a flattened cylinder, and presents on its anterior surface a groove, which extends into the cord to the depth of one third of its diameter. This is the sulcus longitudinalis anterior.

On the posterior surface another fissure exists, which is so narrow as to be hardly perceptible without careful examination. This is the sulcus longitudinalis posterior.

Two other lines are observed on the medulla, the anterior

and posterior sulci, corresponding with the attachment of the anterior and posterior roots of the spinal nerves.

These sulci divide the medulla into four fasciculi, or cords, viz.—the anterior, lateral, posterior, and median posterior columns.

CRANIAL NERVES.

There are nine pairs of cranial nerves. Functionally or physiologically they are divided into four groups, viz.—1. *special sense*—olfactory, optic, auditory; 2. *motion*—motores oculo-

PLATE 86.*

* *The Anatomy of the side of the Neck, showing the Nerves of the Tongue.*— 1. A fragment of the temporal bone, containing the meatus anditorius externus, mastoid, and styloid process. 2. The stylo-hyoid muscle. 3. The stylo-glossus. 4. The stylo-pharyngeus. 5. The tongue. 6. The hyo-glossus muscle—its two portions. 7. The genio-hyo-glossus muscle. 8. The genio-hyoideus; they both arise from the inner surface of the symphysis of the lower jaw. 9. The sterno-hyoid muscle. 10. The sterno-thyroid. 11. The thyro-hyoid, upon which the hyoid branch of the lyngual nerve is seen ramifying. 12. The omo-hyoid crossing the common carotid artery (13), and internal jugular vein (14). 15. The external carotid giving off its branches. 16. The internal carotid. 17. The gustatory nerve giving off a branch to the submaxillary ganglion (18), and communicating a little further on with the lingual nerve. 19. The submaxillary or Wharton's duct, passing forwards to the sublingual gland. 20. The glosso-pharyngeal nerve. 21. The lingual nerve, curving around the occipital artery. 22. The descendens noni nerve, forming a loup with (23) the communicans noni, a branch formed by two filaments, one from the second and one from the third cervical nerve. 24. The pneumogastric nerve, emerging from between the internal jugular vein and common carotid artery, and entering the chest. 25. The facial nerve, emerging from the stylo-mastoid foramen, and crossing the external carotid artery.

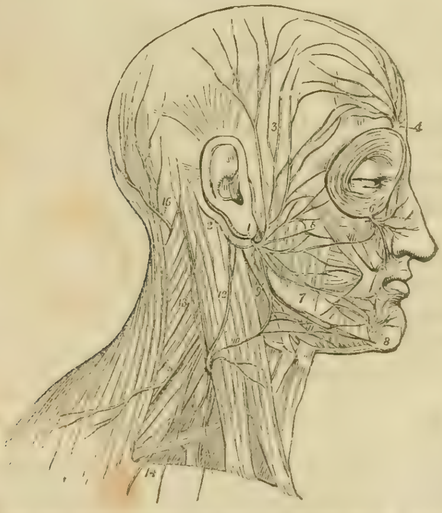
rum, abducentes, lingual; 3. *respiration*—patheticus, fascial glosso-pharyngeal (pheumogastric, spinal accessory); 4. *spinal* —trifacial.

The branches of the *lingual* (the true motive nerve of the tongue), are—the communicating branches with the pneumogastric, spinal accessory, first and second cervical, and sympathetic; the descendent noni, hyoidean branch, and communicating filaments with the gustatory nerve.

The branches of the *facial* nerve are—the tympanic, communicating, posterior auricular, digastric stylo-hyoid, temporo, and cervico-facial.

The facial nerve has been named the *sympatheticus mi-*

PLATE 87.*



* *The Distribution of the Facial Nerve, and the Branches of the Cervical Plexus.*—1 The facial nerve, escaping from the stylo-mastoid foramen, and crossing the ramus of the lower jaw; the parotid gland has been removed, in order to see the nerve more distinctly. 2. The posterior auricular branch; the digastric and stylo-mastoid filaments are seen near the origin of this branch. 3. Temporal branches, communicating with (4) the branches of the frontal nerve. 5. Facial branches, communicating with (6) the infra-orbital nerve. 7. Facial branches, communicating with (8) the mental nerve. 9. Cervical branches, communicating with (10) the superficialis colli nerve, and forming a plexus (11) over the submaxillary gland. The distribution of the branches of the facial in a radiated direction over the side of the face constitutes the pes anserinus. 12. The auricularis magnus nerve, one of the ascending branches of the cervical plexus. 13. The occipitalis minor, ascending along the posterior border of the sterno-mastoid muscle. 14. The superficial and deep descending branches of the cervical plexus. 15. The spinal accessory nerve, giving off a branch to the external surface of the trapezius muscle. 16. The occipitalis major nerve, a posterior branch of the second cervical nerve.

nor, on account of the number of communications it maintains with other nerves, viz.—the auditory nerve, petrosal branch of Vidian, otic ganglion, glosso-pharyngeal, pneumogastric, anterior auricular, auricularis magnus, occipitalis minor, supra and infra orbital, temporo-malar, buccal, mental, and superficialis colli.

PLATE 88.*

The *eighth pair* consists of three nerves, the glosso-pharyngeal, pneumogastric, and spinal accessory.

The branches of the *glosso-pharyngeal* nerve are—communicating branches with the facial, pneumogastric, spinal accessory, and sympathetic; the tympanic, muscular, and pharyngeal.

The branches of the *pneumogastric* nerve are—communicating branches with the facial, glosso-pharyngeal, spinal accessory, lingual, and sympathetic; the pharyngeal, superior laryngeal, cardiac, inferior or recurrent laryngeal, anterior and posterior pulmonary, œsophageal, and gastric.

The branches of the *ophthalmic* nerve are—the frontal, the lachrymal, and the nasal.

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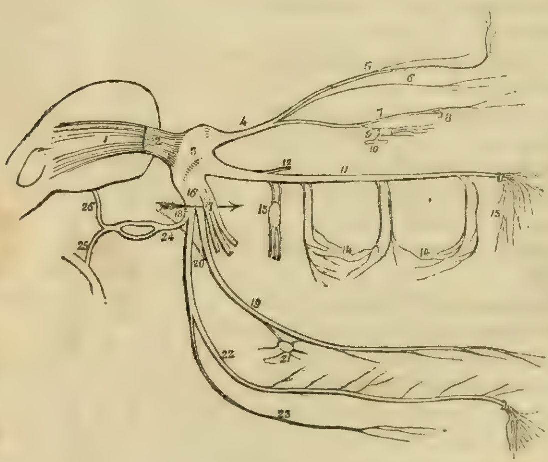
* *Origin and Distribution of the Eighth Pair of Nerves.*—1. The Medulla oblongata. 2. The pons Varolii. 3. The corpus olivare. 4. The corpus restiforme. 5. The facial nerve. 6. The origin of the glosso-pharyngeal nerve. 7. The ganglion of Andersch. 8. The trunk of the nerve. 9. The spinal accessory nerve. 10. The ganglion of the pneumogastric nerve. 11. Its plexiform ganglion. 12. Its trunk. 13. Its pharyngeal branch, forming the pharingeal plexus (14), assisted by a branch from the glosso-pharyngeal (8), and one from the superior laryngeal nerve (15), 16. Cardiac branches. 17. Recurrent laryngeal branch. 18. Anterior pulmonary branches 19. Posterior pulmonary branches. 20. Œsophageal plexus. 21. Gastric branches. 22. Origin of the spinal accessory nerve. 23. Its branches distributed to the sterno-mastoid muscle. 24. Its branches to the trapezius muscle.

Fifth Pair (trifacial).—This nerve is analogous to the spinal nerves in its origin by two roots from the anterior and posterior columns of the spinal cord, and in the existence of a ganglion on the posterior root. Hence it ranges with the spinal nerves, and is considered as the cranial spinal nerve.

The branches of the *nasal* nerve within the orbit are, the ganglionic, ciliary, and infra-trochlear; in the nose it gives one or two filaments to the anterior ethmoidal cells and frontal sinus.

The branches of the *superior maxillary* nerve are divisible

PLATE 89.*



* *A Diagram, showing the Fifth Pair of nerves, with its Branches.*—1. The origin of the nerve by two roots. 2. The nerve escaping from the crus cerebelli. 3. The Casserian ganglion. 4. Its opthalmic division. 5. The frontal nerve, giving off the supra-trochlear branch, and escaping on the forehead through the supra-orbital foramen. 6. The lachrymal nerve. 7. The nasal nerve, passing at 8 through the anterior ethmoidal foramen, and giving off the infra-trochlear branch. 9. The communication of the nasal nerve with the ciliary ganglion. 10. A small portion of the third nerve with which the ganglion is seen communicating; the ganglion gives off the ciliary branches from its anterior aspect. 11. The superior maxillary nerve. 12. Its orbital branch. 13. The two branches communicating with Meckel's ganglion; the three branches given off from the lower part of the ganglion are the posterior palatine nerves. 14. 14. The superior dental nerves, posterior, middle and anterior. 15. The infra-orbital branches, distributed upon the cheek. 16. The inferior maxillary nerve. 17. Its anterior or muscular trunk. 18. The posterior trunk—the two divisions separated by an arrow. 19. The gustatory nerve. 20. The chorda tympani joining it at an acute angle. 21. The submaxillary ganglion. 22. The inferior dental nerve. 23. Its mylo-hyoidean branch. 24. The auricular nerve, dividing behind the articulation of the lower jaw, to reunite and form a single trunk. 25. Its branch of communication with the facial nerve. 26. Its temporal branch.

into three groups:—those which are given off in the spheno-maxillary fossa; those in the infra-orbital canal; and those on the face. They may be thus arranged: 1st group, orbital, two from Meckel's ganglion, posterior dental; 2d, middle and anterior dental; 3d, muscular, and cutaneous.

The *inferior maxillary* is the largest of the three divisions of the fifth nerve. It divides into two trunks, external and internal, which are separated from each other by the external pterygoid muscle.

The external trunk divides into five branches, which are distributed to the muscles of the temporo-maxillary region; they are—the masseteric, temporal, buccal, and external and internal pterygoid.

The internal trunk divides into three branches—the gustatory, inferior dental, and anterior auricular.

SPINAL NERVES.

There are thirty-one pairs of spinal nerves, each arising by two roots, an anterior or motor root, and a posterior or sensitive root.

The spinal nerves are divided into—cervical, 8 pairs; dorsal, 12 pairs; lumbar, 5 pairs; sacral, 6 pairs.

The *cervical plexus* is formed by loops of communication which pass from one nerve to another.

The branches of the cervical plexus may be arranged into three groups, superficial ascending, superficial descending, and deep, viz.—*ascending*, superficialis colli, auricularis magnus, occipitalis minor; *descending*, acromiales, claviculares; *deep*, communicating branches, muscular, communicans noni, phrenic.

AXILLARY PLEXUS.

The axillary plexus of nerves is formed by communications between the anterior branches of the four last cervical and first dorsal nerves.

Its branches may be arranged into two groups, humeral and descending;—*humeral*, short and long thoracic, supra-scapular and subscapular; *descending branches*, external and internal cutaneous, median, ulnar, musculo-spiral, and circumflex.

The branches of the *median* nerve are—muscular, anterior interosseous, superficial palmar, digital.

The branches of the *ulnar* nerve are—muscular in the upper and fore arms, dorsal branch, and superficial and deep palmar.

The branches of the *musculo-spiral* nerve are—the muscular, spiral cutaneous, radial, and posterior interosseous.

DORSAL NERVES.

The dorsal nerves are twelve in number on each side; the first appears between the first and second dorsal vertebræ, and the last between the twelfth dorsal and first lumbar. Each nerve as soon as it has escaped from the intervertebral foramen, divides into two branches, a dorsal branch and the true intercostal nerve.

LUMBAR NERVES.

There are five pairs of lumbar nerves, of which the first makes its appearance between the last dorsal and first lumbar vertebra, and the last between the fifth lumbar and the base of the sacrum.

The lumbar plexus is formed by the anterior branches of the last dorsal and four upper lumbar nerves, the posterior branches passing backwards, to be distributed to the muscles and integument of the loins.

The branches of this plexus are—the musculo and external cutaneous, genito-crural, crural, and obturator.

PLATE 90.*

* *The Axillary Plexus of nerves, with its Branches and their Distribution.*— 1. The axillary plexus. 2. The short thoracic nerves. 3. The long thoracic or external respiratory of Bell. 4. The phrenic nerve. 5. The suprascapular nerve. 6. The subscapular nerves. 7. The external cutaneous nerve. 8. The point at which it pierces the coraco-brachialis muscle. 9. The internal cutaneous nerve; the point at which it pierces the deep fascia. 10. The origin of the median nerve by two heads. 11 The bend of the elbow where the median passes between the two heads of the pronator radii teres, and of the flexor sublimis digitorum. 12. Its muscular branches. 13. Its anterior interosseous branch. 14. The point at which the nerve passes beneath the annular ligament, and divides into five terminal branches. 15. The ulnar nerve, giving off several muscular branches to the triceps. 16. The point at which it passes between the two heads of the flexor carpi ulnaris. 17. Its dorsal branch. 18. The termination of the nerve, dividing into a superficial and deep palmar branch. 19. The musculo-spiral nerve. 20. Muscular branches. 21. Spinal cutaneous nerve. 22. The posterior interosseous nerve piercing the supinator brevis muscle. 23. The radial nerve. The two last nerves are the terminal branches of the musculo-spiral. 24. The point at which the radial nerve pierces the deep fascia. 25. The circumflex nerve.

The branches of the *crural* nerve are—some muscular twigs to the psoas and iliacus muscles, and in the thigh, the cutaneous, muscular, and long and short saphenous nerves.

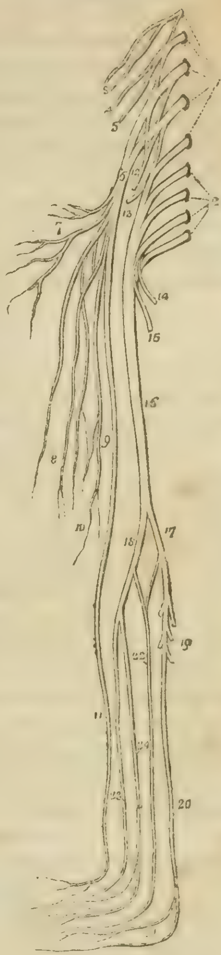
The *posterior tibial* nerve at the inner ankle divides into the internal and external plantar nerves.

Its branches are few—intended for the supply of the deep layer of muscles of the leg.

The *peroneal* nerve gives off but one branch in its course, the communicans peronei, which unites with the communicans poplitei, to form the external saphenous nerve.

The *peroneal cutaneous* nerves pass in front of the ankle joint, and are distributed to the integument of the foot and of the toes; the external supplying three toes and a half, and the internal one and a half.

PLATE 91.*



SYMPATHETIC SYSTEM.

The sympathetic system consists of a series of ganglia extending along each side of the vertebral column, from the head to the coccyx, communicating with all the other nerves of the body, and distributing branches to all the internal organs and viscera.

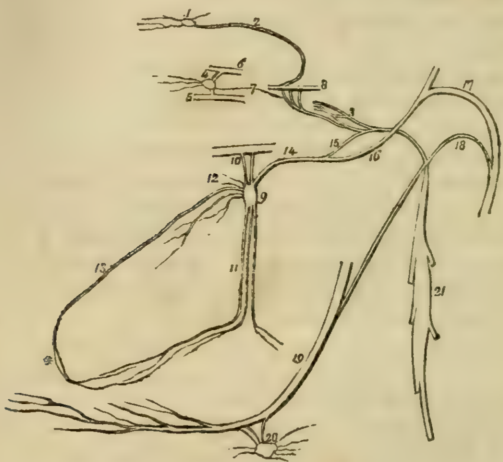
The branches of distribution accompany the arteries which supply the different organs; and form communications around them, which are called plexuses, and take the name of the artery with which they are associated. All the

* *The Lumbar and Sacral Plexuses, with the nerves of the Lower Extremity.*—1. The five lumbar nerves; the four superior, with a branch from the last dorsal, form the lumbar plexus. 2. The four upper sacral nerves, which with the last lumbar form the sacral plexus. 3. The two musculo-cutaneous nerves, branches of the first lumbar nerve. 4. The external cutaneous nerve 5. The genito-crural nerve. 6. The crural, or femoral nerve. 7. Its muscular branches. 8. Its cutaneous branches, middle cutaneous. 9. Its descending, or saphenous branches. 10. The short saphenous nerve. 11. The long, or internal saphenous. 12. The obturator nerve. 13. The gluteal nerve; a branch of the last lumbar, or lumbo-sacral nerve. 14. The internal pudic nerve. 15. The lesser ischiatic nerve. 16. The greater ischiatic nerve. 17. The popliteal nerve. 18. The peroneal nerve. 19. The muscular branches

internal organs of the head, neck and trunk, are supplied with branches from the sympathetic, and some of them exclusively; hence it is considered a nerve of organic life.

It is called the ganglionic nerve, from the circumstance of being formed by a number of ganglia, and from the constant disposition which it evinces, in its distribution, to communicate and form small knots or ganglia.

PLATE 92.*



of the popliteal nerve. 20. The posterior tibial nerve, dividing at 21 into the two plantar nerves. 22. The external saphenous, nerve, formed by the union of the communicans poplitei and communicans peronei. 23. The anterior tibial nerve. 24. The musculo-cutaneous nerve, piercing the deep fascia, and dividing into two cutaneous branches, for the supply of the dorsum of the foot.

* *The Cranial Ganglia of the Sympathetic Nerve.*—1. The ganglion of Ribes. 2. The filament by which it communicates with the carotid plexus (3). 4. The ciliary or lenticular ganglion, giving off ciliary branches for the supply of the globe of the eye. 5. Part of the inferior division of the third nerve, receiving a short thick branch from the ganglion. 6. Part of the nasal nerve, receiving a longer branch from the ganglion. 7. A slender filament, sent directly backwards from the ganglion to the sympathetic branches in the cavernous sinus. 8. Part of the sixth nerve in the cavernous sinus, receiving two branches from the carotid plexus. 9. Meckel's ganglion (spheno-palatine). 10. Its ascending branches, communicating with the superior maxillary nerve. 11. Its descending branches, the posterior palatine. 12. Its anterior branches, spheno-palatine, or nasal. 13. The naso-palatine branch, one of the nasal branches. * The swelling which Cloquet imagines to be a ganglion. 14. The posterior branch of the ganglion, the Vidian nerve. 15. Its carotid branch, communicating with the carotid plexus. 16. Its petrosal branch, joining the angular bend of the facial nerve. 17. The facial nerve. 18. The chorda tympani nerve, which descends to join the gustatory nerve. 19. Gustatory nerve. 20. Submaxillary ganglion, receiving the chorda tympani nerve from the gustatory. 21. Superior cervical ganglion of the sympathetic.

There are six sympathetic ganglia in the head, viz. the ganglion of Ribes; the ciliary, or lenticular; the naso-palatine, or Cloquet's; the spheno-palatine, or Meckel's; the submaxillary; and the otic, or Arnold's; three in the neck—superior, middle, and inferior; twelve in the dorsal region; four in the lumbar region, and four or five in the sacral region.

Each ganglion may be considered as a distinct centre, giving off branches in four different directions, viz. superior, or ascending, to communicate with the ganglion above; inferior, or descending, to communicate with the ganglion below; external, to communicate with the spinal nerves; and internal, to communicate with the sympathetic filaments of the opposite side, and to be distributed to the viscera.

CRANIAL GANGLIA.

Ganglion of Ribes, ciliary, or lenticular ganglion, naso-palatine, or Cloquet's ganglion, spheno-palatine, or Meckel's ganglion, submaxillary ganglion, otic, or Arnold's ganglion.

The ganglion of *Ribes* is small, situated upon the anterior communicating artery, and formed by the the union of the sympathetic filaments which accompany the ramifications of the two anterior cerebral arteries. It is interesting as being the superior point of union between the sympathetic chains of opposite sides of the body.

The *ciliary* is a small quadrangular ganglion, situated within the orbit, between the optic nerve and the external rectus.

Its branches of distribution are the ciliary; they supply the tunics of the eye.

The *naso-palatine* ganglion (Cloquet's) is a small lengthened body, situated in the naso-palatine canal.

The *spheno-palatine* ganglion (Meckel's) occupies the spheno-maxillary fossa, and is of considerable size.

Its branches are divisible into four groups—ascending descending, anterior or internal, and posterior.

The branches of communication are two small ascending, and the posterior branch, or vidian nerve.

The *submaxillary* ganglion is of small size but very distinct, and is situated in the submaxillary gland.

Its branches of distribution are numerous, and ramify upon the ducts of the gland, and upon Wharton's duct.

The *otic* ganglion (Arnold's) is a small red body, resting against the inner surface of the inferior maxillary nerve. It is closely adherent to the internal pterygoid nerve, and appears like a swelling upon that branch.

The branches of the otic ganglion are, two of distribution and five of communication.

CERVICAL GANGLIA.

The superior cervical ganglion is long and fusiform, of a greyish color, and smooth on the surface, and of considerable thickness. It is a single branch, which ascends by the side of the internal carotid, and divides into two branches, which enter the carotid canal to constitute the carotid plexus.

The inferior or descending branch, sometimes two, is the cord of communication with the middle cervical ganglion.

The *cardiac nerves* are—the superior, middle, and inferior, with their branches, plexuses, &c. There is no constancy with regard to the origin and course of these nerves.

THORACIC GANGLIA.

The thoracic ganglia are twelve in number on each side. They are flattened and triangular or irregular in form, and present the peculiar grey color and pearly lustre of the other sympathetic ganglia. They rest upon the heads of the ribs, and are covered in by the pleura costalis. The two first and the last ganglia are usually the largest.

The *semilunar* ganglion is situated by the side of the cœliac axis, and communicates with the ganglion of the other side, so as to form a gangliform cirlce, from which branches pass off in all directions, like rays from a centre. Hence the entire circle has been named the solar plexus.

From the *solar plexus* we have derived the phrenic, gastric, hepatic, splenic, supra-renal and renal, superior and inferior mesenteric, and the spermatic plexuses.

LUMBAR GANGLIA.

The lumbar ganglia are four in number on each side, of the peculiar pearly grey color, fusiform, and situated upon the anterior part of the bodies of the lumbar vertebræ.

The *aortic plexus* is formed by branches from the lumbar ganglia, and receives filaments from the solar and superior mesenteric plexuses.

The *hypogastric plexus* is formed by the termination of the aortic plexus, and by the union of branches from the lower lumbar ganglia. It distributes branches to all the viscera of the pelvis, and to the branches of the internal iliac artery.

SACRAL GANGLIA.

The sacral ganglia are four or five in number on each side. They are situated upon the sacrum, close to the anterior sacral foramina, and resemble the lumbar ganglia in form and mode of connection, although they are much smaller in size.

3DLY. MATTER ORGANIZED AND ANIMATED.

OR MAN POSSESSING HIS FACULTIES UNDER THE INFLUENCE OF THE FIVE SENSES —WHICH MAKES HIM SUBJECT TO DISEASE AND DEATH, AND A RETURN AGAIN TO MATTER, TO ASSIST IN THE ORGANIZATION AND ANIMATION OF OTHER BODIES.

ORGANS OF SENSE.

The *organs of sense*, the instruments by which the animal frame is brought into relation with surrounding nature, are five in number. Four of these organs are situated within the head, viz. the apparatus of *smell*, *sight*, *hearing*, and *taste*, and the remaining organ, of *touch*, is resident in the skin, and is distributed over the entire surface of the body.

THE NOSE AND NASAL FOSSÆ.

The organ of smell consists essentially of two parts: one external, the nose; the other internal, the nasal fossæ.

The nose is the triangular pyramid projecting from the centre of the face, immediately above the upper lip. Superiorly, it is connected with the forehead, by means of a narrow bridge; inferiorly, it presents two openings, the nostrils, which overhang the mouth, and are so constructed that the odor of all substances must be received by the nose before they can be introduced within the lips. The septum between the openings of the nostrils is called the *columna*. Their entrance is guarded by a number of stiff hairs, which project across the openings, and act as a filter in preventing the introduction of foreign substances, such as dust or insects, with the current of air intended for respiration.

The anatomical elements of which the nose is composed are —1. Integument. 2. Muscles. 3. Bones. 4. Fibro-cartilages. 5. Mucous membrane. 6. Vessels and nerves.

1. The integument forming the tip and wings of the nose is extremely thick and dense, so as to be with difficulty separated from the fibro-cartilage. It is furnished with a number of sebaceous follicles, which by their oily secretion protect the extremity of the nose in excessive alternations of temperature. The sebaceous matter of these follicles becomes of a dark color upon the surface, from the attraction of the carbonaceous matter floating in the atmosphere: hence the spotted appearance which the tip of the nose presents in large cities. When the integument is firmly compressed, the inspissated sebaceous secretion is squeezed out from the follicles, and, taking the cylindrical form of their excretory ducts, has the appearance of small white maggots with black heads.

2. The muscles are brought into view by reflecting the integument: they are the pyramidalis nasi, compressor nasi, leva-

tor labii superioris alæque nasi, and depressor labii superioris alæque nasi. They have been already described with the muscles of the face.

3. The bones of the nose are the nasal, and nasal processes of the superior maxillary.

4. The fibro-cartilages give form and stability to the outwork of the nose, providing at the same time, by their elasticity, against injuries. They are five in number—the

Fibro-cartilage of the septum,
Two lateral fibro-cartilages,
Two alar fibro-cartilages.

The fibro-cartilage of the septum, somewhat triangular in form, divides the nose into its two nostrils. It is connected above with the nasal bones and lateral fibro-cartilages; behind, with the ethmoidal septum and vomer; and below, with the palate processes of the superior maxillary bones. The alar fibro-cartilages and columna move freely upon the fibro-cartilage of the septum, being but loosely connected with it by perichondrium.

The lateral fibro-cartilages are also triangular; they are connected, along the middle line, with the fibro-cartilage of the septum; above, with the nasal bones; behind, with the nasal processes of the superior maxillary; and below, with the alar fibro-cartilages.

Alar fibro-cartilages.—Each of these cartilages is curved in such a manner as to correspond with the opening of the nostril, to which it forms a kind of rim. The inner portion is loosely connected with the same part of the opposite cartilage, so as to form the columna. It is expanded and thickened at the point of the nose, to constitute the lobe; and upon the side, forms a curve corresponding with the form of the ala. This curve is prolonged downwards and forwards in the direction of the posterior border of the ala by three or four small fibro-cartilaginous plates, which are appendages to the alar fibro-cartilage.

The whole of these fibro-cartilages are connected with each other, and to the bones, by perichondrium, which, from its membranous structure, permits of the freedom of motion existing between them.

5. The mucous membrane, lining the interior of the nose, is continuous with the skin externally, and with the pituitary membrane of the nasal fossæ within. Around the entrance of the nostrils it is provided with numerous vibrissæ.

6. *Vessels and nerves.*—The arteries of the nose are the lateralis nasi from the facial, and the nasalis septi from the superior coronary.

Its nerves are the facial, infra-orbital, and nasal branch of the ophthalmic.

NASAL FOSSÆ.

To obtain a good view of the nasal fossæ, the face must be divided through the nose by a vertical incision, a little to one side of the middle line.

The nasal fossæ are two irregular, compressed, cavities, extending backwards from the nose to the pharynx. They are bounded, superiorly, by the sphenoid and ethmoid bones. Inferiorly, by the hard palate; and in the middle line they are separated from each other by a bony and fibro-cartilaginous septum.

Upon the outer wall of each fossæ, in the dried skull, are three projecting processes, termed spongy bones. The two superior belong to the ethmoid, the inferior is a separate bone. In the fresh fossæ these are covered with mucous membrane, and serve to increase its surface by their projection and by their convoluted form. The space intervening between the two superior spongy bones is the superior meatus; the space between the middle and inferior bones is the middle meatus; and that between the inferior and the floor of the fossa, is the inferior meatus.

These meatuses are passages which extend from before backwards, and it is in rushing through and amongst these that the atmosphere deposits its odorant particles upon the mucous membrane. There are several openings into the nasal fossæ: thus, in the superior meatus are the openings of the sphenoidal and posterior ethmoidal cells; in the middle, the anterior ethmoidal cells, the frontal sinuses, and the antrum maxillare; and in the inferior meatus, the termination of the nasal duct. In the dried bone are two additional openings, the spheno-palatine and the anterior palatine foramen, the former being situated in the superior and the latter in the infertor meatus.

The mucous membrane of the nasal fossæ is called pituitary, or Schneiderian. The former name being derived from its secretion, the latter from Schneider, who was the first to show that the secretion of the nose proceeded from the mucous membrane, and not from the brain, as was formerly imagined. It is continuous with the general gastro-pulmonary mucous membrane, and may be traced through the openings of the meatuses, into the sphenoidal and ethmoidal cells; into the antrum maxillare; through the nasal duct to the surface of the eye, where it is continuous with the conjunctiva; along the Eustachian tubes into the tympanum and mastoid cells, to which it forms the lining membrane; and through the posterior nares into the pharynx and mouth, and thence through the lungs and alimentary canal.

The surface of this membrane is furnished with a columnar epithelium supporting innumerable cilia.

Vessels and *nerves*.—The arteries of the nasal fossæ are the anterior and posterior ethmoidal, from the ophthalmic artery; and spheno-palatine, and pterygo-palatine, from the internal maxillary.

The nerves are, the olfactory, the spheno-palatine branches from Meckel's ganglion, and the nasal branch of the ophthalmic. The ultimate filaments of the olfactory nerve terminate in minute papillæ.

THE EYE, WITH ITS APPENDAGES.

The form of the eyeball is that of a sphere, having the segment of a smaller sphere ingrafted upon its anterior surface, which increases its antero-posterior diameter. The axes of the two eyeballs are parallel with each other, but do not correspond with the axes of the orbits, which are directed outwards. The optic nerves follow the direction of the orbits, and therefore enter the eyeballs to their nasal side.

The globe of the eye is composed of tunics and humors. The tunics are three in number,

1. Sclerotic and cornea,
2. Choroid, iris, and ciliary processes,
3. Retina and zonula ciliaris.

The humors are also three—

Aqueous,
Crystalline (lens),
Vitreous.

1. The sclerotic and cornea form the external tunic of the eyeball, and give to it its peculiar form. Four fifths of the globe are invested by the sclerotic, the remaining fifth by the cornea.

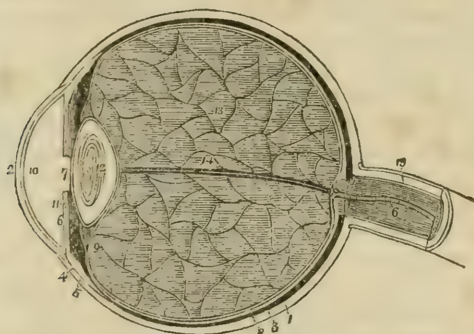
The sclerotic (hard) is a dense fibrous membrane, thicker behind than in front. It is continuous, posteriorly, with the sheath of the optic nerve, which is derived from the dura mater, and it is pierced by that nerve, as well as by the ciliary nerves and arteries. Anteriorly it presents a bevelled edge, which receives the cornea in the same way that a watch glass is received by the groove in its case. Its anterior surface is covered by a thin tendinous layer, the tunica albuginea, derived from the expansion of the tendons of the four recti muscles. By its posterior surface it gives attachment to the two oblique muscles. The tunica albuginea is covered for a part of its extent by the mucous membrane of the front of the eye, the conjunctiva; and by reason of the brilliancy of its whiteness, gives occasion to the common expression, "the white of the eye."

At the entrance of the optic nerve, the sclerotic forms a thin cribriform lamella, which is pierced by a number of minute openings for the passage of the nervous filaments. One of these openings, larger than the rest, and situated in the centre of the lamella, is the porus opticus, through which the arteria centralis retinæ enters the eye.

The cornea is the transparent projecting layer that forms the anterior fifth of the globe of the eye. In its form it resembles a watch glass. In structure it consists of five or six thin lamellæ, connected to each other by a delicate cellular tissue. It is covered by the conjunctiva in front, and lined by the membrane of the aqueous humor behind. By its edge, which is sharp and thin, it is received within the bevelled border of the sclerotic, to which it is very firmly attached. It is thicker than the anterior portion of the sclerotic.

The cornea is not perfectly circular, the transverse diameter being slightly greater than the vertical. This form is particularly evident in animals. The opacity of the cornea, pro-

PLATE 93*.



* *A Longitudinal Section of the Globe of the Eye.*—1. The sclerotic, thicker behind than in front. 2. The cornea, received within the anterior margin of the sclerotic, and connected with it by means of a bevelled edge. 3. The choroid, connected anteriorly with (4) the ciliary ligament, and (5) the ciliary processes. 6. The iris. 7. The pupil. 8. The third layer of the eye, the retina, terminating anteriorly by an abrupt border at the commencement of the ciliary processes. 9. The canal of Petit, which encircles the lens (12). The thin layer in front of this canal is the zonula ciliaris, a prolongation of the vascular layer of the retina to the lens. 10. The anterior chamber of the eye, containing the aqueous humor; the lining membrane by which the humor is secreted, is represented in the diagram. 11. The posterior chamber. 12. The lens, more convex behind than before, and enclosed in its proper capsule. 13. The vitreous homor enclosed in the hyaloid membrane, and in cells formed in its interior by that membrane. 14. A tubular sheath of the hyaloid membrane, which serves for the passage of the artery of the capsule of the lens. 15. The neurilema of the optic nerve. 16. The arteria centralis retinæ, embedded in it's centre.

duced by pressure on the globe, results from the infiltration of fluid into the cellular tissue connecting its layers. This appearance cannot be produced in a sound living eye.

Dissection.—The sclerotic and cornea are now to be dissected away from the second tunic; this, with care, may be easily performed, the only connections subsisting between them being at the circumference of the iris, the entrance of the optic nerve, and the perforation of the ciliary nerves and arteries. Pinch up a fold of the sclerotic near its anterior circumference, and make a small opening into it; then raise the edge of the tunic, and with a pair of fine scissors, having a probe point, divide the entire circumference of the sclerotic, and cut it away bit by bit. Then separate it from its attachment around the circumference of the iris by a gentle pressure with the edge of the knife. The dissection of the eye must be conducted under water.

In the course of this dissection the ciliary nerves and long ciliary arteries will be seen passing forwards between the sclerotic and choroid, to be distributed to the iris.

2. The second tunic of the eyeball is formed by the choroid, ciliary ligament and iris, the ciliary processes being an appendage developed from its inner surface.

The choroid is a vascular membrane, of a rich chocolate-brown color upon its external surface, and of a deep black color within. It is connected to the sclerotic externally by an extremely fine cellular tissue, and by the passage of nerves and vessels. Internally it is in simple contact with the third tunic of the eye, the retina. It is pierced posteriorly for the passage of the optic nerve, and is connected anteriorly with the iris, ciliary process, and junction of the cornea and sclerotic, by a dense white structure, the ciliary ligament, which surrounds the circumference of the iris like a ring.

The choroid membrane is composed of three layers:—1. An external or venous, which consists principally of veins arranged in a peculiar manner; hence they have been named venæ verticosæ. The marking upon the surface of the membrane produced by these veins resembles so many centres, to which a number of curved lines converge It is this layer which is connected with the ciliary ligament. 2. The middle or arterial layer is formed principally by the ramifications of minute arteries, and secretes upon its surface the pigmentum nigrum. It is reflected inwards at its junction with the ciliary ligament, so as to form the ciliary processes. 3. The internal layer is a delicate membrane, which presents a beautiful appearance beneath the microscope; it is composed of several laminæ of regular hexagonal cells, which contain the granules of pigmentum ni-

grum, and are arranged so as to resemble a tesselated pavement.

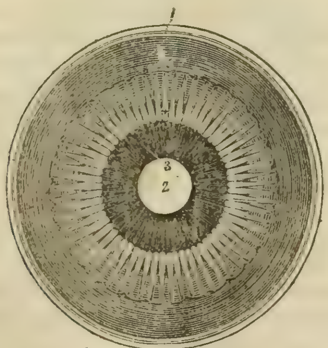
In animals, the pigmentum nigrum, upon the posterior wall of the eyeball, is replaced by a layer of considerable extent, and of metalic brilliancy, called the tapetum.

The ciliary ligament, or circle, is the bond of union between the external and middle tunics of the eye, and serves to connect the cornea and sclerotic with the iris and external layer of the choroid. It is also the point to which the ciliary nerves and vessels proceed previously to their distribution, and it receives the anterior ciliary arteries through the anterior margin of the sclerotic. A minute vascular canal is situated within the ciliary ligament, called the ciliary canal, or the canal of Fontana, from its discoverer.

The iris (rainbow) is so named from its variety of color in different individuals; it forms a septum between the anterior and posterior chambers of the eye, and is pierced in its centre by a circular opening, which is called the pupil. By its periphery it is connected with the ciliary ligament, and by its inner circumference forms the margin of the pupil; its anterior surface looks towards the cornea, and the posterior towards the ciliary process and lens.

It is composed of two layers, an anterior, or muscular, consisting of radiating fibres, which converge from the circumference towards the centre, and have the power of dilating the pupil; and the circular, which surround the pupil like a sphincter, and by their action produce contraction of its area. The

PLATE 94.*



* *The Anterior Segment of a Transverse Section of the Globe of the Eye, as seen from within.*—1. The divided edge of the three tunics; sclerotic, choroid (the dark layer), and retina. 2. The pupil. 3. The iris. 4. The ciliary processes. 5. The scalloped anterior border of the retina.

posterior layer is of a deep purple tint, and is thence named uvea, from its resemblance in color to a ripe grape.

The ciliary processes may be seen in two ways, either by removing the iris from its attachment to the ciliary ligament, when a front view of the processes will be obtained, or by making a transverse section through the globe of the eye, when they may be examined from behind, as in plate 94.

The ciliary processes consist of a number of triangular folds, formed apparently by the plaiting of the internal layer of the choroid. They are, according to Zinn, about sixty in number, and may be divided into large and small, the latter being situated in the spaces between the former. The periphery is connected with the ciliary ligament, and is continuous with the internal layer of the choroid. The central border is free, and rests against the circumference of the lens. The anterior surface corresponds with the uvea; the posterior receives the folds of the zonula ciliaris between its processes, and thus establishes a connection between the choroid and the third tunic of the eye. The ciliary processes are covered with a thick layer of pigmentum nigrum, which is more abundant upon them, and upon the anterior part of the choroid, than upon the posterior. When the pigment is washed off, the processes are of a whitish color.

3. The third tunic of the eye is the retina, which is prolonged forwards to the lens by the zonula ciliaris.

Dissection.—If after the preceding dissection the choroid membrane be carefully raised and removed, the eye being kept under water, the retina may be seen very distinctly.

The retina is composed of three layers—

External, or Jacob's membrane,
Middle, Nervous membrane,
Internal Vascular membrane.

Jacob's membrane is extremely thin, and is seen as a flocculent film when the eye is suspended in water. Examined by the microscope, it is seen to be composed of granules having a tesselated arrangement. Dr. Jacob considers it a serous membrane.

The nervous membrane is the expansion of the optic nerve, and forms a thin semi-transparent bluish white layer, which envelopes the vitreous humor, and extends forwards to the commencement of the ciliary processes, where it terminates in an abrupt scalloped margin.

This layer has been observed by Treviranus to be composed of cylindrical fibres, which proceed from the optic nerve and bend abruptly inwards, near their termination, to form the internal papillary layer, which lies in contact with the hyaloid

membrane; each fibre constituting by its extremity a distinct papilla.

The vascular membrane consists of the ramifications of a minute artery, the arteria centralis retinæ, and its accompanying vein; the artery pierces the optic nerve and enters the globe of the eye through the porus opticus in the centre of the lamina cribrosa. This artery may be seen very distinctly by making a transverse section of the eyeball. Its branches are continuous anteriorly with the zonula ciliaris.

This vascular layer forms distinct sheaths for the nervous papillæ, which constitute the inner surface of the retina.

The retina is deficient posteriorly at a spot corresponding with the axis of the globe of the eye. This spot is called the foramen of Soemmering, and is surrounded by a yellow halo, the limbus luteus. It exists only in animals having the axis of the eyeballs parallel with each other, as man, quadrumana, and some reptiles, and is said to give passage to a small lymphatic vessel.

The zonula ciliaris (zonula of Zinn) is a thin vascular layer, which connects the anterior margin of the retina with the circumference of the lens. It presents upon its surface a number of small folds corresponding with the ciliary processes, between which they are received. These processes are arranged in the form of rays around the lens, and the spaces between them are stained by the pigmentum nigrum of the ciliary processes.

PLATE 95.*

* *The Posterior Segment of a Transverse Section of the Globe of the Eye, as seen from within.*—1. The divided edge of the three tunics. The membrane covering the whole internal surface is the retina. 2. The entrance of the optic nerve with the arteria centralis retinæ piercing its centre. 3, 3. The ramifications of the arteria centralis. 4. The foramen of Soemmering, in the centre of the axis of the eye; the shade from the sides of the section obscures the limbus luteus which surrounds it. 5. Folds of the retina, which generally obscure the foramen of Soemmering after the eye has been opened.

They derive their vessels from the vascular layer of the retina. The under surface of the zonula is in contact with the hyaloid membrane, and around the lens forms the anterior fluted wall of the canal of Petit.

The connection between these folds and the ciliary processes may be very easily demonstrated by dividing an eye transversely into two portions, then raising the anterior half, and allowing the vitreous humor to separate from its attachment by its own weight. The folds of the zonula will then be seen to be drawn out from between the folds of the ciliary processes.

Humors.—The aqueous humor is situated in the anterior and posterior chambers of the eye.

The anterior chamber is the space intervening between the cornea in front, and the iris and pupil behind.

The posterior chamber, smaller than the anterior, is the narrow space bounded by the posterior surface of the iris and pupil in front, and by the ciliary processes and lens behind.

The two chambers are lined by a thin layer, the secreting membrane of the aqueous humor.

The vitreous humor forms the principal bulk of the globe of the eye. It is enclosed in a delicate membrane, the hyaloid, which sends processes into its interior, forming cells in which the humor is retained. A small artery may sometimes be traced through the centre of the vitreous humor to the capsule of the lens; it is surrounded by a tubular sheath of the hyaloid membrane. This vessel is easily injected in the fœtus.

The crystalline humor or lens is situated immediately behind the pupil, and is surrounded by the ciliary processes, which slightly overlap its margin. It is more convex on the posterior than on the anterior surface, and is embedded in the anterior part of the vitreous humor, from which it is separated by the hyaloid membrane. It is invested by a proper capsule, which contains a small quantity of fluid called liquor Morgagni, and is retained in its place by the attachment of the zonula ciliaris.

The lens consists of concentric layers, of which the external are soft, the next firmer, and the central form a hardened nucleus. These layers are best demonstrated by boiling, or by immersion in alcohol, when they separate easily from each other. Another division of the lens takes place at the same time; it splits into three triangular segments which have the sharp edge directed towards the centre, and the base towards the circumference. The concentric lamellæ are composed of minute parallel fibres, which are united with each other by means of scalloped borders; the convexity on the one border fitting accurately the concave scallop upon the other.

Immediately around the circumference of the lens is a triangular canal, the canal of Petit, which is bounded in front by

the flutings of the zonula ciliaris; behind by the hyaloid membrane, and within by the border of the lens.

The *vessels* of the globe of the eye are the long and short and anterior ciliary arteries, and the arteria centralis retinæ. The long ciliary arteries, two in number, pierce the posterior part of the sclerotic, and pass forward on each side, between that membrane and the choroid, to the ciliary ligament, where they divide into two branches, which are distributed to the iris. The short ciliary arteries pierce the posterior part of the sclerotic coat, and are distributed to the internal layer of the choroid membrane. The anterior ciliary are branches of the muscular arteries. They enter the eye through the anterior part of the sclerotic, and are distributed to the iris. It is the increased number of these arteries in iritis that forms the peculiar red zone around the circumference of the cornea.

The arteria centralis retinæ enters the optic nerve at about half an inch from the globe of the eye, and passing through the porus opticus is distributed upon the inner surface of the retina, forming its vascular layer; one branch pierces the centre of the vitreous humor, and supplies the capsule of the lens.

The *nerves* of the eyeball are the optic, two ciliary nerves from the nasal branch of the opthalmic, and the ciliary nerves from the ciliary ganglion.

Observations.—The sclerotic is a tunic of protection, and the cornea a medium for the transmission of light. The choroid supports the vessels destined for the nourishment of the eye, and by its pigmentum nigrum absorbs all loose and scattered rays that might confuse the image impressed upon the retina. The iris, by means of its powers of expansion and contraction, regulates the quantity of light admitted through the pupil. If the iris be thin, and the rays of light pass through its substance, they are immediately absorbed by the uvea; and if that layer be insufficient, they are taken up by the black pigment of the ciliary process.

In Albinoes, where there is an absence of the pigmentum nigrum, the rays of light traverse the iris and even the sclerotic, and so overwhelm the eye with light, that sight is destroyed, except in the dimness of evening, or at night.

In the manufacture of optical instruments, care is taken to color their interior black, with the same object—the absorption of scattered rays.

The transparent lamellated cornea and the humors of the eye have for their office the refraction of the rays in such proportion as to direct the image in the most favorable manner upon the retina. Where the refracting medium is too great, as in over convexity of the cornea and lens, the image falls short

of the retina (near-sightedness); and where it is too little, the image is thrown beyond the nervous membrane (far-sightedness).

These conditions are rectified by the use of spectacles, which provide a differently refracting medium external to the eye, and thereby correct the transmission of light.

APPENDAGES OF THE EYE.

The appendages of the eye are the eyebrows, eyelids, conjunctiva, caruncula lachrymalis, and the lachrymal apparatus.

The *eyebrows* are two projecting arches of integument, covered with short thick hairs, which form the upper boundary of the orbits. They are connected beneath with the orbicularis, occipito-frontalis, and corrugator supercilii muscles; their use is to shade the eyes from a too vivid light, or protect them from particles of dust and moisture flowing over the forehead.

The *eyelids* are two valvular layers placed in front of the eye, and serve to defend it from injury by their closure. When drawn open, they leave between them an eliptic space, the angles of which are called canthi. Near to the inner canthus, two small projections are observed on both lids, upon which are seen the openings of the lachrymal ducts.

The eyelids have, entering into their structure, *integument, orbicularis muscle, tarsal cartilages, Meibomian glands*, and *conjunctiva*.

The tegumentary cellular tissue of the eyelids is remarkable for its looseness and for the entire absence of adipose substance. It is particularly liable to serous infiltration. The fibres of the orbicularis muscle covering the eyelids are extremely thin and pale.

The tarsal cartilages are two thin lamellæ of fibro-cartilage, which give form and support to the eyelids. The superior is of a semilunar form, broad in the middle, and tapering to each extremity. Its lower border is broad and flat, its upper is thin, and gives attachment to the levator palpebræ and to the fibrous membrane of the lids.

The inferior fibro-cartilage is a narrow elliptical band situated in the substance of the lower lid. Its upper border is flat, and corresponds with the flat edge of the upper cartilage. The lower is held in its place by the fibrous membrane. The cartilages do not extend quite so far as the angles of the lids.

The fibrous membrane of the lids is firmly attached to the periosteum around the margin of the orbit by its circumference, and to the tarsal cartilages by its central margin. It is thick and dense on the outer half of the orbit, but becomes thin to its inner side. Its use is to retain the tarsal cartilages in their place, and give support to the lids; hence it has been named the broad tarsal ligament.

The Meibomian glands are embedded in the internal surface

of the cartilages, and are very distinctly seen on examining the inner surface of the lids. They have the appearance of parallel strings of pearls, about twenty or twenty-four upon each cartilage, and open by minute foramina upon the edges of the lids. They correspond in length with the breadth of the cartilage, and are consequently longer in the upper than in the lower lid.

Each gland consists of a single lengthened follicle or tube, into which a number of small clustered follicles open; the latter are so numerous as almost to conceal the tube by which the secretion is poured out upon the margin of the lids.

The edges of the eyelids are furnished with a triple row of long thick hairs, which curve upwards from the upper lid, and downwards from the lower, so that they may not interlace with each other in the closure of the eyelids, and prove an impediment to the opening of the eyes. These are the eyelashes, important organs of defence to the sensitive surface of so delicate an organ as the eye.

The conjunctiva is the mucous membrane of the eye. It covers the whole of its anterior surface, and is then reflected upon the lids, so as to form their internal layer. It is very thin, and closely adherent where it covers the cornea, and no vessels can be traced into it. Upon the sclerotica it is thicker and less adherent, and to the inner surface of the lids is connected by loose cellular tissue. It is continuous with the general gastro-pulmonary mucous membrane, and sympathises in its affections, as may be observed in various diseases. From the surface of the eye it may be traced through the lachrymal ducts into the lachrymal gland; along the edges of the lids it is continuous with the mucous lining of the Meibomian glands, and at the inner angle of the eye may be followed through the puncta lachrymalia into the lachrymal sac, and thence downwards through the nasal duct into the inferior meatus of the nose.

This membrane is coated with a lamellated epithelium, composed of vesicles and flattened scales, with central nuclei.

The caruncula lachrymalis is the small reddish body which occupies the inner angle or canthus of the eye. In health it presents a bright pink tint, in sickness it loses its color and becomes pale. It consists of an assemblage of mucous follicles, and is the source of the whitish secretion which so constantly forms at the inner angle of the eye. It is frequently found studded with short hairs.

Immediately to the outer side of the caruncula is a slight duplicature of the conjunctiva, called plica semilunaris, which is the rudiment of the third lid of animals, and membrana nictitans of birds.

Vessels and *nerves.*—The palpebræ are supplied internally

with arteries from the ophthalmic, and externally from the facial and transverse facial. Their nerves are branches of the fifth and of the facial.

LACHRYMAL APPARATUS.

The lachrymal apparatus consists of the lachrymal gland with its excretory ducts; the puncta lachrymalia, and lachrymal ducts; the lachrymal sac and nasal duct.

The lachrymal gland is a small, flattened bilobate body, situated at the upper and outer angle of the eye, resting upon the eyeball by its under surface, and against the wall of the orbit by the upper. Its secretion is poured out upon the surface of the conjunctiva by seven small excretory ducts.

Lachrymal ducts.—Near to the inner canthus are two slight projections on the edges of the eyelids. These are the lachrymal tubercles; and upon the point of each may be seen a small opening, the punctum lachrymale, the commencement of the corresponding lachrymal duct. From these points the lachrymal ducts proceed to the lachrymal sac. The superior duct at first ascends, and then turns suddenly inwards towards the sac, forming an abrupt angle. The inferior duct forms the same kind of angle, by descending at first, and then turning abruptly inwards. They are dense and elastic in structure, and remain constantly open, so that they act like capillary tubes in absorbing the tears from the surface of the eye. The two fasciculi of the tensor tarsi muscle are inserted into these ducts, and serve to draw them inwards.

The lachrymal sac is the upper extremity of the nasal duct, and is scarcely more dilated than the rest of the canal. It is lodged in the groove of the lachrymal bone, and is often distinguished internally from the nasal duct by a semilunar or circular valve. It consists of mucous membrane, but is covered in and retained in its place by a fibrous expansion, derived from the tendon of the orbicularis, which is inserted into the ridge on the lachrymal bone; it is also covered by the tensor tarsi muscle, which arises from the same ridge, and in its action upon the lachrymal ducts may serve to compress the lachrymal sac.

The nasal duct is a short canal, directed downwards, backwards, and a little inwards, to the inferior meatus of the nose where it terminates by an expanded orifice. It is lined by the mucous membrane, which is continuous with the conjunctiva above and the pituitiary membrane of the nose below. Obstruction from inflammation and suppuration of the duct constitute the disease called fistula lachrymalis.

Vessels and *nerves.*—The lachrymal gland is supplied with blood by the lachrymal branch of the ophthalmic artery, and

with nerves by the lachrymal branch of the ophthalmic and orbital branch of the superior maxillary.

THE ORGAN OF HEARING.

The ear is composed of three parts. 1. External ear. 2. Middle ear, or tympanum. 3. Internal ear, or labyrinth.

The *external* ear consists of two portions, the pinna and meatus; the former representing a kind of funnel, which collects the vibrations of the atmosphere, called sounds, and the latter a tube which conveys the vibrations to the tympanum.

The pinna presents a number of folds and hollows upon its surface, which have different names assigned to them. Thus the external folded margin is called the helix (a fold). The elevation parallel to and in front of the helix is called antihelix (opposite). The pointed process, projecting like a valve over the opening of the ear from the face, is called the tragus (goat), probably from being sometimes covered with bristly hair like that of a goat; and a tubercle opposite to this is the antitragus. The lower dependent and fleshy portion of the pinna is the lobulus. The space between the helix and antihelix is named the fossa innominata. Another depression is observed at the upper extremity of the antihelix, which bifurcates and leaves a triangular space between its branches, called the scaphoid fossa; and the large central space to which all the channels converge, is the concha, which opens directly into the meatus.

The pinna is composed of integument, fibro-cartilage, ligaments, and muscles.

The integument is thin, and closely connected with the fibro-cartilage.

The fibro-cartilage gives form to the pinna, and is folded so as to produce the various convexities and grooves which have been described upon its surface.

The helix commences in the concha, and partially divides that cavity into two parts; on its anterior border is a tubercle for the attachment of the attrahens aurem muscle, and a little above this a small vertical fissure, the fissure of the helix. The termination of the helix and antihelix forms a lengthened process, the processus caudatus, which is separated from the concha by an extensive fissure. Upon the anterior surface of the tragus is another fissure, the fissure of the tragus, and in the lobulus the fibro-cartilage is wholly deficient. The fibro-cartilage of the meatus, at the upper and anterior part of the cylinder, is divided from the concha by a fissure which is closed in the entire ear by ligamentous fibres; it is firmly attached at its termination to the processus auditorius.

The ligaments of the external ear are those which attach the pinna to the side of the head, viz. the anterior, posterior, and li-

gament of the tragus; and those of the fibro-cartilage, which serve to preserve its folds and connect the opposite margins of the fissures. The latter are two in number—the ligament between the concha and the processus caudatus, and the broad ligament which extends from the upper margin of the fibro-cartilage of the tragus to the helix, and completes the meatus.

The proper muscles of the pinna are—the

Major helicis,
Minor helicis,
Tragicus,
Antitragicus,
Transversus auriculæ.

The major helicus is a narrow band of muscular fibres, situated upon the anterior border of the helix, just above the tragus.

PLATE 96.*

* *A Diagram of the Ear.*—*p*. The pinna. *t*. The tympanum. *l*. The labyrynth. 1. The upper part of the helix. 2. The antihelix. 3. The tragus. 4. The antitragus. 5. The lobulus. 6. The concha. 7. The upper part of the fossa innominata. 8. The meatus. 9. The membrana tympani, divided by the section. 10. The three little bones, crossing the area of the tympanum, malleus, incus, and stapes; the foot of the stapes blocks up the fenestra ovalis upon the inner wall of the tympanum. 11. The promontory. 12. The fenestra rotunda: the dark opening above the ossicula leads into the mastoid cells. 13. The Eustachian tube; the little canal upon this tube contains the tensor tympani muscle. in its passage to the tympanum. 14. The vestibule. 15. The three semicircular canals, horizontal, perpendicular and oblique. 16. The ampullæ upon the perpendicular and horizontal canals. 17. The cochlea. 18. The convexities of the two tubuli which communicate with the tympanum and vestibule; the one is the scala tympani, terminating at 12; the other is the scala vestibuli.

The minor helicis is placed upon the posterior border of the helix, and at its commencement in the fossa of the concha.

The tragicus is a thin quadrilateral layer of muscular fibres, situated upon the tragus.

The antitragicus arises from the antitragus, and is inserted into the posterior extremity, or processus caudatus of the helix.

The transversus auriculæ, partly tendinous and partly muscular, extends transversely from the convexity of the concha to that of the helix, on the posterior surface of the pinna.

These muscles are rudimentary in the human ear, and deserve only the titles of muscles in the ears of animals. Two other muscles are described by Mr. Tod, the obliquus auris and contractor meatus, or trago-helicus.

The *meatus auditorius* is a canal partly cartilagenous and partly osseous, about an inch in length, which extends inwards and a little forwards, from the concha to the tympanum. It is narrower in the middle than at each extremity, forms an oval cylinder, the long diameter being vertical, and is slightly curved upon itself, the concavity looking downwards.

It is lined by an extremely thin pouch of cuticle, which, when withdrawn after maceration, preserves the form of the meatus. Some stiff short hairs are also found in its interior, which stretch across the tube, and prevent the ingress of insects and dust. Beneath the cuticle are a number of small ceruminous follicles, which secrete the wax of the ear.

Vessels and *nerves.*—The pinna is plentifully supplied with arteries, by the anterior auricular from the temporal, and by the posterior auricular from the external carotid.

Its nerves are derived from the auricular branch of the fifth, and the auricularis magnus of the cervical plexus.

Tympanum—The tympanum is an irregular bony cavity, compressed from without inwards, and situated within the petrous bone. It is bounded externally by the meatus and membrana tympani; internally by its inner wall, and in its circumference by the petrous bone and mastoid cells.

The membrana tympani is stretched obliquely from above downwards across the extremity of the meatus auditorius, and gives attachment by its centre and inner surface to the handle of the malleus. It is depressed towards the centre, being concave towards the meatus, and convex towards the tympanum, and is composed of three layers, an external cuticular, middle fibrous and muscular, and internal mucous, derived from the mucous lining of the tympanum.

The tympanum contains three small bones, ossicula auditus, viz. the malleus, incus, and stapes.

The malleus (hammer) consists of a head, neck, handle (manubrium), and two processes, long (gracilis), and short (brevis).

It is attached by the manubrium to the membrana tympani, being enclosed between the mucous and the fibrous layer, and extending by its extremity to near the middle of the membrane. The long process descends to the fissura Glaseri, and gives attachment to the laxator tympani muscle. Into the short process is inserted the tendon of the tensor tympani, and the head of the bone articulates with the incus.

The incus (anvil) is named from an imagined resemblance to an anvil. It has also been likened to a bicuspid tooth, having one root longer and widely separated from the other. It consists of two processes, which unite nearly at right angles, and at their junction form a flattened body, to articulate with the head of the malleus. The short process is free; the long process descends nearly parallel with the handle of the malleus, and curves inwards near to its termination. At its extremity is a small globular projection, the os orbiculare, which is a distinct bone in the fœtus, but becomes anchylosed to the long process of the incus in the adult. It articulates with the head of the stapes.

The stapes is shaped like a stirrup, to which it bears a close resemblance. Its head articulates with the os orbiculare, and the two branches are connected by their extremities with a flat oval-shaped plate, representing the foot of the stirrup, which fits accurately the opening between the tympanum and the vestibule, the fenestra ovalis. The neck of the stapes gives attachment to the stapedius muscle.

The muscles of the tympanum are four in number—the

Tensor tympani,
Laxator tympani,
Laxator tympani minor,
Stapedius.

The tensor tympani arises from the spinous process of the sphenoid, from the petrous portion of the temporal bone; and from the Eustachian tube, and passes forwards in a distint canal, separated from the tube by the processus cochleariformis, to be inserted into the handle of the malleus, immediately below the commencement of the processus gracilis.

The laxator tympani arises from the spinous process of the sphenoid bone, and passes through an opening in the fissura Glaseri, to be inserted into the long process of the malleus.

The laxator tympani minor arises from the upper margin of the meatus, and is inserted into the handle of the malleus, near to the processus brevis.

The stapedius arises from the interior of the pyramid, and escapes from its summit, to be inserted into the neck of the stapes.

The openings in the tympanum are ten in number, five large and five small; they are—

Large Openings.	*Small Openings.*
Meatus auditorius,	Entrance of the chorda tympani,
Fenestra ovalis,	Exit of the chorda tympani,
Fenestra rotunda,	For the laxator tympani,
Mastoid cells,	For the tensor tympani,
Eustachian tube.	For the stapedius.

The opening of the meatus auditorius has been previously described.

The fenestra ovalis is an oval opening, situated in the upper part of the inner wall of the tympanum, directly opposite the meatus; it is the opening of communication between the tympanum and vestibule, and is closed by the foot of the stapes and by the lining membranes of both cavities.

The fenestra rotunda is somewhat triangular in its form, and situated in the inner wall of the tympanum, below and rather posterior to the fenestra ovalis, from which it is separated by a bony elevation called the promontory. It serves to establish a communication between the tympanum and the cochlea. In the fresh subject it is closed by a proper membrane, as well as by the mucous lining of both cavities.

The mastoid cells are very numerous, and occupy the whole of the interior of the mastoid process, and part of the petrous bone. They communicate by a large irregular opening with the upper and posterior circumference of the tympanum.

The Eustachian tube is a canal of communication extending obliquely between the pharynx and the anterior circumference of the tympanum. In structure it is partly fibro-cartilagenous and partly osseous, is broad and expanded at its pharyngeal extremity, and narrow and compressed at the tympanum.

The smaller openings serve for the transmission of the chorda tympani nerve, and three of the muscles of the tympanum.

The opening by which the chorda tympani enters the tympanum is near the root of the pyramid, at about the middle of the posterior wall.

The opening of exit for the chorda tympani is at the fissura Glaseri in the anterior wall of the tympanum.

The opening for the laxator tympani muscle is also situated in the fissura Glaseri, in the anterior wall of the tympanum.

The opening for the tensor tympani muscle is in the anterior wall, immediately above the opening of the Eustachian tube.

The opening for the stapedius muscle is at the apex of a conical bony eminence, called the pyramid, which is situated on the posterior wall of the tympanum, immediately behind the fenestra ovalis.

Directly above the fenestra ovalis is a rounded ridge formed by the projection of the aquæductus Fallopii.

Beneath the fenestra ovalis, and separating it from the fenestra rotuda, is the promontory, a rounded projection channelled upon its surface by three small grooves, which lodge the three tympanic branches of Jacobson's nerve.

The foramina and processes of the tympanum may be arranged, according to their situation, into four groups.

1. In the external wall is the meatus auditorius, closed by the membrana tympani.

2. In the inner wall, from above downwards, are the

Ridge of the aquæductus Fallopii,
Fenestra ovalis,
Promontory,
Grooves for Jacobson's nerve,
Fenestra rotunda.

3. In the posterior wall are, the

Opening of the mastoid cells,
Pyramid,
Opening for the stapedius,
Apertura chordæ (entrance).

4. In the anterior wall are, the

Eustachian tube,
Opening for the tensor tympani,
Opening for the laxator tympani,
Apertura chordæ (exit).

The tympanum is lined by a vascular mucous membrane, which invests the ossicula and chorda tympani, and forms the internal layer of the membrana tympani. From the tympanum it is reflected into the mastoid cells, which it lines throughout, and passes through the Eustachian tube, to become continuous with the mucous membrane of the pharynx.

Vessels and *nerves.*—The arteries of the tympanum are derived from the internal maxillary, internal carotid, and posterior auricular.

Its nerves are—1. Minute branches of the facial, which are distributed to the muscles. 2. The chorda tympani, which leaves the facial nerve near the stylo-mastoid foramen, and arches upwards to enter the tympanum at the foot of the pyramid; it then passes forwards between the handle of the malleus and long process of the incus, to the opening in the fissura Glaseri. 3. The tympanic branches of Jacobson's nerve, which are distributed to the membranes of the fenestra ovalis and fenestra rotunda, and to the Eustachian tube, and form a plexus by communicating with the carotid plexus and otic ganglion.

INTERNAL EAR.

The internal ear is called *labyrinth*, from the complexity of its communications; it consists of a series of cavities which are channelled through the substance of the petrous bone, and is situated between the cavity of the tympanum and the meatus auditorius internus.

The labyrinth consists of the

Vestibule,
Semicircular canals,
Cochlea.

The *vestibule* is a small oval cavity, situated immediately within the inner wall of the tympanum. It is named vestibule, from being, as it were, the hall of communication between the other cavities of the ear. It therefore presents a number of openings, corresponding with these different cavities. They may be arranged, like those of the tympanum, into large and small.

The large openings are seven in number, viz.—the

Fenestra ovalis,
Scala vestibuli,
Five openings of the three semicircular canals.

The small openings are—the

Aquæductus vestibuli,
Openings for small arteries,
Three openings for branches of the auditory nerve.

The fenestra ovalis is closed by the lining membrane of the vestibule, and by the foot of the stapes. It is the opening into the tympanum.

The opening of the scala vestibuli is the communication between the vestibule and the cochlea.

The aquæductus vestibuli is the commencement of the small canal which opens upon the posterior surface of the petrous bone. It gives passage to a small artery, and to a small vein which terminates in the superior petrosal sinus.

The openings for the arteries and nerves are situated in the internal wall of the vestibule, and correspond with the termination of the meatus auditorius internus.

The *semicircular canals* are three bony passages which communicate with the vestibule; one is perpendicular in its direction, and corresponds with a tubercle upon the anterior surface of the petrous bone; another is oblique; and the third horizontal. Each canal presents a dilatation at one extremity, which is called ampulla. The two undilated extremities of the perpendicular and oblique canals unite to form a single

tube; all the others open singly into the vestibule—hence the five openings of the three canals.

The vestibule contains two sacs, formed by the expansion of the auditory nerve. The larger of these is the utriculus communis, the smaller the sacculus proprius. The semicircular canals contain tubes of nervous membrane, which communicate with the utriculus communis, and form three dilatations, corresponding with the ampullæ at the extremities of the canals. These sacs, together with the nervous tubes lodged in the canals, contain a limpid secretion, which is called liquor of Cotunnius. The sacs likewise contain a calcareous deposit, which is analogous to the otolites, or calcareous crystalline masses found in the vestibular sacs of fishes.

The sacs and membranous canals do not completely fill the cavities of the bone, but leave a space which is occupied by another fluid, the liquor of Scarpa, or aqua labyrinthi.

The *cochlea* (snail shell) is a spiral canal, which describes two turns and a half round a central pillar which is called modiolus. It is situated in the anterior part of the petrous bone, its base being directed backwards and inwards, and corresponding with the termination of the cul-de-sac of the meatus auditorius internus.

The canal of the cochlea is divided into two equal parts by a thin bony lamina (lamina spiralis), which is wound spirally around the modiolus. The two half canals, thus formed, are called scala tympani and scala vestibuli.

At the apex of the cochlea the two scalæ communicate, and form a dilated cavity, which is termed the cupola. The lamina spiralis is not continued entirely across the canal of the cochlea, but is completed by the mucous membrane which lines its interior. Near to the termination of the scala tympani is the opening of a small canal, aquæductus cochleæ, which passes backwards to the jugular fossa. It transmits a small vein from the cochlea, which opens into the commencement of the internal jugular vein.

The cavity of the cochlea is lined throughout by a thin mucous membrane, which is continuous with that of the vestibule, but which closes the fenestra rotunda. It is filled with the aqua labyrinthi.

The openings into the cochlea are, the fenestra rotunda from the tympanum, the opening into the vestibule, the aquæductus cochleæ, and the openings for the branches of the auditory nerve.

Auditory nerve.—When the auditory nerve reaches the extremity of the meatus auditorius internus, it divides into two branches. 1. The larger, or anterior, to the cochlea. 2. The smaller, or posterior, to the vestibule and semicircular canals.

The anterior branch divides into a number of minute filaments, which pierce the base of the cochlea, and expand in its mucous lining; others enter the modiolus, which is hollowed into canals to receive them, and pass off through small openings in its circumference, to spread out in the mucous membrane covering the lamina spiralis.

The posterior or vestibular portion of the nerve divides into three branches, which are distributed—1. The larger, to form the utriculus communis and the membranous tubes of the perpendicular and horizontal canals. 2. To form the sacculus proprius. 3. The smallest, to form the membranous tube of the oblique canal. The extremities of the nervous filaments, both in the cochlea and vestibule, form a papillary layer upon the internal surface of the nervous membrane, like that of the retina.

The arteries of the labyrinth are derived principally from the auditory branch of the superior cerebellar artery.

ORGAN OF TASTE.

The *tongue* is composed of muscular fibres, which are distributed in layers arranged in various directions; thus some are disposed longitudinally, others transversely, others again obliquely and vertically. Between the muscular fibres is a considerable quantity of adipose substance.

The tongue is connected posteriorly with the os hyoides by muscular attachment, and to the epiglottis by mucous membrane, forming the three folds which are called frena epiglottidis. On either side it is held in connection with the lower jaw by mucous membrane, and in front a fold of that membrane is formed beneath its under surface, which is named frænum linguæ.

The surface of the tongue is covered by a dense layer analogous to the corium of the skin, which gives support to the papillæ. A raphe marks the middle line of the organ, and divides it into symmetrical halves.

The *papillæ* of the tongue are—the

Papillæ circumvallatæ,
Papillæ conicæ,
Papillæ filiformes,
Papillæ fungiformes.

The papillæ circumvallatæ are of large size, and from fifteen to twenty in number. They are situated on the dorsum of the tongue, near its root, and form a row upon each side, which meets its fellow at its middle line, like the two branches of the letter A. Each papilla resembles a cone, attached by the apex to the bottom of a cup-shaped depression; hence they are also

named papillæ calyciformes. This cup-shaped cavity forms a kind of fossa around the papilla, whence their name, circumvallatæ.

At the meeting of the two rows of these papillæ upon the middle of the root of the tongue, is a deep mucous follicle called foramen cæcum.

The papillæ conicæ and filiformes cover the whole surface of the tongue in front of the circumvallatæ, but are most abundant near its apex. They are conical and filiform in shape, and have their points directed backwards.

The papillæ fungiformes are irregularly dispersed over the dorsum of the tongue, and are easily recognized amongst the other papillæ, by their rounded heads and larger size. A number of these papillæ will generally be observed at the tip of the tongue.

Behind the papillæ circumvallatæ, at the root of the tongue, are a number of mucous glands, which open upon the surface. They have been improperly described as papillæ by some authors.

Vessels and *nerves*.—The tongue is abundantly supplied with blood by the lingual arteries.

The nerves are three in number, and of large size:—1. The gustatory branch of the fifth, which is distributed to the papillæ, and is the nerve of common sensation and of taste. 2. The glosso-pharyngeal, which is distributed to the mucous membrane, follicles, and glands of the tongue, is a nerve of sensation and motion; it also serves to associate the tongue with the pharynx and larynx. 3. The lingual, which is the motor nerve of the tongue, and is distributed to the muscles.

The mucous membrane, which invests the tongue, is continuous with the cutis along the margins of the lips. On either side of the frænum linguæ it may be traced through the sublingual ducts into the sublingual glands, and along Wharton's ducts into the submaxillary glands; from the sides of the cheeks it passes through the openings of Stenton's ducts to the parotid gland; in the fauces it forms the assemblage of follicles called tonsils, and may be thence traced downwards into the larynx and pharynx, where it is continuous with the general gastro-pulmonary mucous membrane.

Beneath the mucous membrane of the mouth, are a number of small glandular granules, which pour their secretion upon the surface. A considerable number of them are situated within the lips, in the palate, and in the floor of the mouth. They are named from the position which they may chance to occupy, labial, palatine glands, &c.

ORGAN OF TOUCH.

The *skin* is composed of three layers, viz.—the

Cutis,
Rete mucosum,
Cuticle.

The cutis (dermis), or true skin, covers the entire sursace of the body, and is continuous with the mucous membrane which lines its cavities. It consists of two layers, a deep one called corium, and a superficial or papillary layer.

The corium is the base of support to the skin, and owes its density of structure to an interlacement of fibrous bands, which form a firm and elastic web. By its under surface it is connected with the common superficial fascia of the body, and presents a number of areolæ, in which are lodged small masses of adipose tissue.

PLATE 97.*

* *The Anatomy of the Skin.*—1. The cuticle, showing the oblique laminæ of which it is composed, and the imbricated disposition of the ridges upon its surface. 2. The rete mucosum. 3. Two of the quadrilateral papillary masses, such as are seen in the palm of the hand or sole of the foot; they are composed of minute conical papillæ. 4. The deeper layer of the cutis, the corium. 5. Adipose vesicles, showing their appearance beneath the microscope. 6. A perspiratory gland, with its spiral duct, auch as is seen in the palm of the hand or sole of the foot. 7. Another perspiratory gland with a straighter duct, such as is seen in the scalp. 8. Two hairs from the scalp, enclosed in their follicles; their relative depth in the skin is preserved. 9. A pair of sebaceous glands, opening by short ducts into the follicles of the hair.

On the upper surface, the fibres are more closely aggregated, and form a smooth plane for the support of the papillary layer.

The corium differs very much in thickness in different parts of the body; thus, on the lips, eyelids and scrotum, it is extremely thin. On the head, back, soles of the feet, and palms of the hand, it is very thick; and on the more exposed parts of the body it is much thicker than on those which are protected.

The papillary layer is soft, and formed by minute papillæ, which cover every part of its surface. On the body generally, the papillæ are very small and irregular in their distribution: they are best seen in the palm of the hand or sole of the foot, where they are disposed in linear ridges, as indicated by the markings on the cuticle. The ridges of papillæ in these situations are separated from each other by transverse furrows into small quadrilateral rounded masses. These quadrilateral masses are each composed of a considerable number of minute papillæ, which are conical in form and variable in length, one or two of the papillæ in each mass being generally longer than the rest. In the middle of the transverse furrow, between the papillæ, is the opening for the perspiratory duct.

The papillæ beneath the nail have a peculiar form and arrangement. At the root of the nail they are numerous, but small and very vascular; opposite to the part of the nail called lunula, they are scarcely raised above the surface, and less vascular; but beyond this point they form lengthened vascular plicæ, which afford a large surface for secretion. These lengthened papillæ deposite the horny secretion in longitudinal lamellæ, which give to the nail the ribbed appearance which it presents upon its surface.

Vessels and *nerves.*—The papillæ are abundantly supplied with vessels and nerves, the former to enable them to perform the office of secretion in the production of the cuticle, the latter to give them the sensibility necessary to an organ of touch.

The rete mucosum is the soft medium which is situated between the papillary surface of the cutis and cuticle; after a careful maceration it may be separated as a distinct layer, particularly in the negro, where it is firmer than in the white man, and contains the coloring matter of the skin.

The name rete mucosum, given to it by Malpighi, conveys a very inaccurate notion of its structure; for it is neither a network, nor is it mucous. It is thin upon the general surface of the body, but is thicker in the palm of the hand and sole of the foot, and presents a close correspondence with the thickness of the cuticle. Examined with the microscope, it is seen to be moulded accurately upon the papillæ, being thick in the spaces between these, and thin over their convexities; hence arises the appearance of a network. In the rete mucosum, from the

hand these depressions are arranged in a linear series, as are the papillæ; in other situations they are more irregular, but correspond alway with the distribution of the papillæ.

The rete mucosum is the freshly secreted layer of cuticle, and gradually hardens as it approaches the surface. It has been shown to be composed of minute oval vesicular cells, which become converted in the hardened cuticle into flattened scales, each containing a central nucleus. The dark pigment of the negro exists in the form of small granules of coloring matter.

The cuticle (epidermis, scarf-skin), is the horny unorganized lamella which covers and protects the entire surface of the more delicate layers of the skin. In situations exposed to pressure, as the palm of the hand and sole of the foot, it is very thick; in other parts it forms only a thin layer. The cuticle is marked on the surface by a network of lines; these are more numerous and larger near to joints, where they form deep wrinkles, on account of the inelastic nature of its structure. Their appearance differs in different regions of the body; but every where depends upon the same cause, the inelasticity of the cuticle. At the entrance to the cavities of the body, it is continuous with the epithelium, or cuticular covering of the mucous membrane.

The cuticle is secreted by the cutis in the form of laminæ, the innermost and last secreted layer being the rete mucosum. The laminæ are composed of minute scales with central nuclei, and are disposed obliquely, so as to project by their free extremities upon the surface of the skin; in the palm of the hand and sole of the foot, these layers correspond with the elevations of the papillæ, and present an imbricated linear surface. This is particularly seen on the points of the fingers, where the rows of papillæ have a circular arrangement.

Upon the inner surface of the cuticle, a number of depressions and linear furrows are seen, corresponding with the projections of the papillæ. A number of conical processes are also observed on this surface, which correspond with the passage of hairs through the cuticle, and with the openings of the perspiratory ducts.

The openings in the cuticle are the pores or openings for the perspiratory ducts, the openings for the passage of the hairs, and those of the sebaceous follicles.

APPENDAGES TO THE SKIN.

The appendages to the skin are the nails, hairs, sebaceous glands, and perspiratory glands and ducts.

The *nails* are parts of the cuticle secreted in the same manner, composed of the same material, but disposed in a peculiar

way to serve an especial purpose—the protection of the tactile extremities of the fingers. They are inserted by their roots into a deep groove of the skin (matrix), and are firmly attached to the papillary surface by the close connection of the papillæ with the longitudinal laminæ. The white semilunar segment near the root of the nail is called the lunula. The cuticle is closely connected with it all round, and in maceration the nail comes off with that layer.

The *hairs* have a very different structure and arrangement from that of the nails; they are inserted for a considerable depth within the integument, and terminate in conical or somewhat bulbous roots. Each hair is enclosed beneath the surface by a vascular secretory follicle, which regulates its form during its growth.

Hairs are very rarely completely cylindrical; they are generally more or less compressed, and somewhat prismoid in form. The transverse section is reniform; in texture it is dense and homogeneous towards the circumference, and porous and cellular in the centre, like the pith of a plant.

The *sebaceous glands* are abundant in some parts of the skin, as in the arm-pits, the nose, &c., and vary in complexity of structure, from a simple pouch-like follicle to a lobulated gland. At the extremity of the nose they have several lobes; and in the scalp they are lobulated like a bunch of grapes, and terminate in the follicles of the hairs near the surface of the skin. They secrete an oily fluid, which is poured out upon the surface of the skin, and tends to preserve the flexibility of the cuticle.

The *perspiratory ducts* are minute spiral tubes which commence in small lobulated glands, situated deeply in the integument beneath the corium and among the adipose vesicles. They are easily seen by examining a thin perpendicular section of the skin from the palm of the hand, with a lens of moderate power. Proceeding from the glands, the ducts ascend through the transverse fissure, between the quadrilateral masses of papillæ and through the rete mucosum, to terminate by open pores upon the surface of the cuticle. That portion of the tube which is situated in the cuticle, is pretty equally spiral; but that below the level of the papillary surface is very irregularly twisted, and is often nearly straight. In the scalp the tubes are serpentine, or but slightly curved.

The *pores* are best observed during perspiration, when the fluid is seen oozing through their minute openings. In the hand and sole of the foot they are easily seen by the naked eye without this assistance. They are disposed at regular distances along the ridges of the cuticle, and give rise to the appearance of lines cutting the ridges transversely.

INDEX.

HISTORY OF THE EFFORTS OF DR. SAMUEL THOMSON

TO SUSTAIN HIS SYSTEM OF

VITALITY IN MATTER.

Of all the reformers in the science of medicine, there appears to have been no one more successfnl in perfecting his system of practice, and receiving the congratulations of grateful nations during his lifetime, than *Samuel Thomson.*

BIRTH AND PARENTAGE.

This man was born in the town of Alstead, in the state of New-Hampshire, Feb. 9th, 1769. His parents were poor, but industrious, and taught their son to imitate their habits of industry and economy; and over his principles of moral honesty they watched with unceasing vigilance.

The father of young Thomson was one of the most enterprising and determined spirits of the age, and he thought every person should possess the same indomitable perseverance as himself; and fortunately for future generations, he succeeded in imbuing the mind and composition of his son with that peculiar tact, talent, and trait of character, which at maturity has rendered him one of the greatest benefactors the world has ever known.

COMMENCES AT HARD LABOR.

At a very early age (five years) he was put to hard labor upon a farm, and his daily task was always better fitted for those of riper years. But he was rigidly required to perform the amount of labor allotted to him, without complaint; and such was the severity of his labor, that at the age of seven years he was round shouldered, and stooped forward like a hard laboring old man.

The writer of this has frequently heard him say, that after having performed his daily task he has been sent for the cows, and so great was his fatigue of body from labor, that on sitting down to rest he would unconsciously fall asleep, and that his father by calling to him has awoke him at the distance of half a mile, so sensitive was his hearing to the voice of his father, of whom he lived in such constant fear, on account of the severity of his punishment at the slightest offence.

Under such a tutor, whose severity he was able to stand, who will wonder that Samuel Thomson had a robust and vigorous constitution at a more mature age. We are astonished that his constitution and health were not entirely destroyed under such severity.

Such a disciplinarian as the father, and such a pupil as the son, have made Samuel Thomson the nondescript that we find him. For where can we find a match-mate for this man? As it has terminated, the severity of his parental treatment has matured a firmness of muscle, a determination of spirit, and an indomitable perseverance and an untiring industry, that knows *not* the meaning, practically, of the common method of complaint, "*I cannot do it;*" but *I will try*, was what this youth was taught to say, let the task be ever so onerous; and not to give up, until bodily and mental efforts had proved, by actual application, inadequate to the task.

Our readers, after learning the early history, habits and industry of young Thomson, will have the key to the masterly secret, why he in after life could, without complaint, buffet persecution, imprisonment, irons, and a trial for life, for the sake of truth, and the good of mankind.

HIS TALENT FOR INVESTIGATION.

At a very early age, our hero evinced a disposition to examine closely the works and mysteries of nature; for as he had not the opportunity for book knowledge that others of his age were permitted to enjoy, the deficiency he consequently endeavored to supply, with what he could accumulate by observation.

One principle which was instilled into his mind in youth, was brought into active requisition in more mature age. That was, not to take for fact, all that was told for truth. Before he believed marvellous stories, his philosophic mind was brought into active operation to scan the rationale, the circumstances, consistency, &c., and then reason dictated whether to accept or reject, believe or disbelieve, the report. And when the mind was once settled as to the correctness or falsity of the position assumed, he maintained it, through good or evil report. And under such circumstances, one of the most noble traits of the character of Samuel Thomson was made manifest. Where the truth was concerned, he knew no fear; and he would promulgate it, whether unpopular or not. He would attack the lawyer, minister, doctor or statesman, or any other person, without regard to place or station, who he supposed had given countenance to a falsehood, or any other wrong principle, to sustain power or honors, or to acquire wealth.

EXAMINING VEGETATION.

While upon the farm, young Thomson was constantly tasting the different vegetable substances, with which the face of nature appeared clad during their appropriate seasons. Knowing the fact, that certain plants were gathered by individuals, to be cured for medical uses, it was natural for him to enquire to what purposes those plants were applied, the diseases to

which they were applicable, &c., and such was his tact for acquiring medical facts, and treasuring them up in his retentive memory, that at the age of sixteen years he had a very extensive knowledge of the medical virtues of most of the plants in his vicinity.

LOBELIA INFLATA.

Possessing in this respect many advantages over the other youth of his age in his neighborhood, it was in his power to play off many a juvenile trick upon his more unsuspecting playmates, upon whom the emetic properties of the Lobelia inflata were brought into requisition, and from which may be dated the knowledge of the useful and active properties of that valuable herb. Thus he continued to store away in his active and retentive memory, medical facts in relation to the properties of plants, merely as sustenance to his active and enquiring mind, not even anticipating that future generations were about to tax his fund of medical knowledge for the good of posterity.

MARRIAGE—BIRTH OF A DAUGHTER—SICKNESS, &C.

On the 7th day of July, 1790, Samuel Thomson was united in wedlock with Susanna Allen, of Surry, New-Hampshire. On the 4th of July following, his eldest child was born. Soon after, the mother went into fits, and notwithstanding she had the attendance of six of the best medical men the county could produce, she grew worse, and a seventh doctor was sent for; but she continued to grow worse under their care.

DISAGREEMENT AMONG THE DOCTORS.

One would give her medicine, and another said it was wrong; another would propose to bleed her, and a fourth would say it would kill her; and this is a fair specimen of their management of the patient, and treatment to each other. Thomson found they were trying their experiments upon his wife, which so much dissatisfied him, that he dismissed them all the same night, after they had pronounced her incurable, and sent for two *root doctors*, by whose efforts she was restored to feeble health.

CASE OF COLIC.

In about one month she was attacked with the colic, and the two physicians were employed who had restored her in her former sickness; but the disease had a run of several days, in spite of their efforts. These attacks continued once a month or oftener; and it was attended with so much trouble to go for the doctors so often, during those attacks, that Thomson employed one to remove into a house upon one part of his farm, so as to have him at hand in time of sickness.

BIRTH OF SECOND CHILD—CASE OF SCARLET FEVER.

In March, 1794, Mrs. Thomson was confined with her second child (a daughter), but received no other medical assistance than that of her husband, with the advice of the doctor who resided on the farm. After this time, she was never attacked with the colic.

When this child was two years old, she was attacked with canker rash. Dr. Bliss, who resided on the farm, was sent for, and he said she had that disorder as bad as any one he ever saw. He tried his utmost to prevent putrefaction; and, after using his best exertions without doing any good, he gave her up to die. She was senseless, and the canker was to be seen in her mouth, nose, and ears, and one of her eyes was covered with it, and closed. The other eye began to swell, and turn purple also. Thomson asked the doctor if he could not keep the canker out of the other eye; he said it would be of no use, for she could not live. He then informed the doctor, that if he (the doctor) could do no more for the child, he would try himself, as he found that without immediate assistance the child would be blind with both eyes; and she was so much distressed that she would spring up in bed, in struggling for breath. In this case we see the germ of Thomson's steaming process.

FIRST TRIAL OF STAEMING IN SICKNESS.

He sat down in a chair and held the child in his lap, and put a blanket around them both, and Mrs. Thomson held a hot spider or shovel between his feet, and he poured on vinegar to raise a steam, and kept it as hot as she could bear it, changing them as often as they became cold; and by following this plan about twenty minutes, she became comfortable and breathed easy.

COLD WATER FOR INFLAMMATION.

A cloth wet with cold water was kept upon the eyes, changing it as often as it grew warm. Dr. Thomson informs us, that he continued this steaming process, once in two hours, for about one week, when the patient began to gain. Her eyes came open; the one that was worst was completely covered with canker, and as white as paper.

ASTRINGENTS USED FOR CANKER.

In this case, we see the first use of the astringent wash, or rough medicine, to take off the coat of canker from the eyes, which was made of marsh-rosemary; and when the scale came off the right eye, the sight came out with it, and it entirely perished. The left eye was saved, to the astonishment of all, and especially the doctor, who said she was saved by the treatment

received from the young Æsculapius, who first found out the use of steaming and cold water, as an application in this case. After this successful debut in the healing art, we are informed that he found by experience that putting a hot stone into a kettle with water sufficient partly to cover it, and then pouring vinegar on the stone, was an improvement in steaming, for which he had abundant occasion in after years in his own family.

THIRD CHILD BORN—LONG FEVER, &C.

A short time before this daughter was taken sick, the third child, a son, was born, and was very weakly, in consequence of the mother's having, previous to his birth, what was then called the three months' fever; which experience gave Thomson a good knowledge of the management of the doctors to prolong the disease, as he could never harbor the idea that a doctor was of any use, if the fever must have its course, and nature perform the cure in the end. Yet the doctor got his pay, and the credit of the cure. If nature was sufficiently strong to resist the combined attacks of the disease and the doctor, they would recover; if not, they would run down in what was called the galloping consumption. The doctor undertook to manage with Mrs. Thomson, but her husband interfered, and dismissed him. As soon as she stopped taking his medicines she began to gain, and soon got about.

CROUP, OR RATTLES.

When this son was about six weeks old, he was taken with the croup or rattles. and very much distressed, so that he could be heard all over the house. Not yet being entirely satisfied with the doctor's skill, he was sent for again, and attended the child until about ten o'clock at night, without doing any good, and he then left for home, saying that the child would not live until morning.

RATTLE SNAKE'S OIL FIRST USED.

Thomson's inventive genius was again taxed, to do for the sick what those who professed superior skill failed in performing. We are informed, that in this case he had recourse to rattle snake's oil, and succeeded in making the child quite comfortable by the next morning.

THOMSON'S MEDICAL SKILL APPRECIATED.

We now for the first time begin to see the medical knowledge of Dr. Thomson appreciated ; as we are told that the doctor came in the next morning, and was much surprised on seeing the child so much better, and wished to know what had wrought the change ; and on being informed, appeared much pleased with the information ; and he observed, that he was willing to allow that the greatest knowledge that doctors ever

obtained, was either by accident or through necessity. So the cure which was discovered for this desperate disease by necessity, was of great value both to the doctor and himself. Yet we are informed that Thomson was charged by the doctor for his useless visit, notwithstanding the information he gained of the experimenter.

GATHERING ROOTS AND HERBS.

After his great success in his own family in time of sickness, we are informed that Dr. Thomson began to gather all kinds of roots and herbs in the proper season, and prepare them for medicine, to prevent as well as to cure disease, for he found by experience that "an ounce of prevention was worth a pound of cure."

NOT EXPECTING TO PRACTICE.

Dr. Thomson informs us, that he had not the most distant idea of engaging in the practice of medicine, more than to assist those of his own family in time of sickness; and little did he expect, as he very justly remarks, what those severe trials and sufferings in his own family were destined to bring about. "It seemed," said he, "as a judgment upon me and my family, for some one living with me was sick most of the time while the doctor lived on the farm, which was seven years. Since I have had more experience, and become better acquainted with the subject, I am satisfied as to the cause, which was excessive bleeding, and taking too much physic."

After the doctor had removed from the farm, we are informed that he had but little sickness in his family.

SECOND SON BORN—NO MIDWIFE.

On the birth of his second son, which was two years from that of the first, he had no occasion for a doctor. Thomson informs us, that his wife did well, and the child was much more healthy than the others had been; and he informs us also, that he has never employed a doctor since, as he had found from sad experience that they made more disease than they cured.

HIS OWN PHYSICIAN.

When any of his family were taken sick, he found no difficulty in restoring them to health, from the fund of practical knowledge which he had acquired from the more desperate cases of disease which he had already successfully treated.

INSTRUCTION TO CHILDREN.

We are informed, that as fast as his children arrived to years of discretion, they were instructed how to avoid, as well as to cure disease; and they have generally enjoyed good health since.

BIRTH OF 3D SON—MIDWIFE PRESENT—SEVERE SICKNESS.

At the birth of his third son, Thomson informs us, he employed a midwife, and soon after the child was born his wife was taken with ague fits and cramp in the stomach; she was in great distress, and they were all much alarmed at her situation. "I proposed to make use of some of my medicines (says Thomson), but it was strenuously objected to by the midwife, who said she wished to have a doctor, and the sooner the better. A physician was immediately sent for, and I proposed to give her something to afford temporary relief until the doctor came; but it was all to no purpose, the midwife would not hear to it. She said the patient was in a very dangerous situation, and not more than one in twenty lived through it, and probably she would not live more than twenty-four hours from that time."

THE WIFE AGAIN RESTORED, AFTER BEING GIVEN OVER—FIFTH CASE.

The man who went for the doctor having returned without him, and there being no other within six miles, I then, (says he) came to the determination of hearing to no one's advice, but to pursue my own plan. I told my wife, that as the midwife said she could not live more than twenty-four hours, therefore there would not be much hazard in my attempting to relieve her. I gave her warm medicines, to raise the inward heat, and then applied the steam, which was much opposed by the midwife; but I persisted in it, according to the best of my judgment, and relieved her in one hour, after she had lain in that situation about four hours, without any thing being done, waiting for a doctor. The midwife expressed much astonishment at the success attending my efforts, and said that I had saved my wife's life, for she was certain that without the means I had used she could not have lived. She continued to do well and soon recovered.

This makes the fifth time, he remarks, that I had applied to the mother of invention for assistance, after the failure of others, and in all of them was completely successful.

HIS SUCCESS APPRECIATED.

"The success which had attended my efforts in my own family (he observes) caused much conversation in the neighborhood, and in some instances I was employed in consequence of my successful nursing, and in all cases I was completely triumphant.

BIRTH OF FIFTH SON—THIRD DAUGHTER, &C.

The next sickness of his wife took place, says Thomson, in 1799; and in about two years after, she had another son, and

did well; making in all five sons in succession, after which she had another daughter, which was the last of eight children—five sons and three daughters. "The different circumstances through which I passed in bringing up this family of children, the scenes of sickness and distress, the experience acquired of the regular practice, and the success attending my efforts in time of disease, are the occasion of my mentioning them so minutely. The knowledge and experience, however, which I gained by these scenes, I have reason to be satisfied with, as they have proved to be a blessing, not only to me, but to many hundreds of others, who have been relieved from sickness and distress through my instrumentality. And I hope and trust, that it will eventually be the cause of throwing off the veil of ignorance from the eyes of the good people of this country, and doing away the blind confidence they are so much in the habit of placing in those who call themselves physicians; who fare sumptuously every day, living in splendor and magnificence, supported by the impositions they practise upon a deluded and credulous people. It appears to me that the physicians have much more regard for their own interest than for the health and happiness of those who are so unfortunate as to have any thing to do with them."

KNOWLEDGE ACQUIRED BY EXPERIMENTS ON OTHERS.

"If this was the worst side of the picture, it might be borne with more patience; but their practice is altogether experimental, to try the effect of their poisons upon their patients; and if they happen to give any more than nature can bear, they either die, or become miserable invalids for life. There are many physicians within my knowledge who do not follow the fashionable practice of the day, but are governed by their own judgment, and make use of vegetable medicines of our own country, with the mode of treatment the most consistent with nature."

FIRST CASE OF MEASLES.

"Some time in the month of November, 1802, my children were taken with the measles, and some of them had the complaint very bad. The want of the knowledge how to treat them, gave me a great deal of trouble—much more than it would at the present time—for experience has taught me that they are very easy to manage. One of my children took the disease and gave it to the rest, and I think we had four down with them at one time. My third son had the disorder very bad; they would not come out, but continued in the system, and he turned purple and became stupid. The canker was in his throat and mouth, and the rosemary would have no effect. Putrid symptoms made their appearance, and I was then under

the necessity of inventing something to allay those symptoms and remove the canker. I used the steam of vinegar to guard against putrefaction, and gold thread (Coptis trifolia) with red oak acorns (Quercus rubra), pounded and steeped together, for the canker. This remedy had the desired effect, and by close attention he soon began to improve."

SECOND ATTACK.

"The second son was attacked nearly in the same manner as the first, and I pursued nearly the same course of treatment, with similar success; but the disease had so affected his lungs that I feared he would have the consumption. He could not speak aloud for three weeks. I could do nothing that would help him, until I gave him several potions of the emetic herb, (Lobelia inflata) which relieved him, and he soon got well. During this sickness, we suffered much from fatigue and want of sleep, for neither my wife nor myself had our clothes off for twelve nights. This was a good fortnight's school to me, in which I learned much of the nature and treatment of the measles, and found it to be canker and putrefaction. This experience enabled me to relieve many others of this complaint, and likewise of the canker rash. In these two disorders, and the small pox, I found a looking-glass, in which may be seen the nature of every other disease."

SMALL POX.

"I had the small pox in 1798, and examined its symptoms with all the skill I was capable of, to ascertain the nature of the disease; and I found it was the highest stage of canker and putrefaction that the human system was capable of bearing; the measles the next in point of virulence, and the canker rash, or scarlet fever, the least of the three. And all other disorders partake more or less of the same, which I am satisfied is a key to the whole; for by knowing how to cure those complaints, will furnish a general rule by which all other complaints may be safely treated; as the same means that will put out a large fire will extinguish a candle."

MRS. REDDING—CASE OF COLIC.

"Soon after my family had recovered from the measles, I was sent for to attend a woman by the name of Redding, who had been afflicted with the colic for several years, and could find no relief from the doctors. I attended her in my usual way, and found that canker was the cause of her complaint, and in a very short time restored her to health, insomuch that she has never had another attack to my knowledge. The lady was restored to health in so simple a manner that it became a subject of ridicule; and when asked about her situation, she

was ashamed to acknowledge that I had performed the cure. It appeared there could be nothing done right but by the regular physicians. I attended in this family for several years, and always successfully; but my treatment was so simple, and my remedies so universally known to the people, that my services were not considered worthy of compensation. Finding that such remuneration would not support my family, I refused entirely to do any thing more for them. After which they had plenty of sickness, and doctor's bills to attend to, and one bill amounted to one hundred dollars; while I did not receive a cent.

MRS. WETHERBEE'S CASE.

I was soon after called upon to attend a Mrs. Wetherbee, who had been troubled with violent attacks of the colic, about once a month, for a number of years. and having heard of my success in the Redding family. I gave her the medicine to remove canker, and steamed her, which relieved her in one hour. She had a large family to attend to, having thirteen children, and before she gained her strength she had another attack. I attended her again, and again relieved her. But she would not be prudent, so as to gain her strength, but must go to work again, and took cold and had a third attack. Her husband said that I only relieved her for the time, but did not remove the cause. Consequently, he sent for a physician to remove the complaint, who carried her through a course of mercury, which reduced her to that degree that she was not able to attend to her domestic affairs in eight weeks; and then he decided that she had the consumption, and gave her over to die.

After the doctor had left her to die, she again applied to me, but I declined doing any thing for her, as I knew her situation was much worse than when the doctor commenced with her; and should I fail in effecting a cure, the blame would all be placed to my account, and if she got well I should get no credit for the cure.

One day, after finishing my forenoon's work, on going to dinner I found her at my house waiting for me to come home, and she entreated so hard for me to undertake to cure her, and seemed to have so much faith of ultimate success, that I consented, provided she would come to my house and stay with my wife, I would do the best I could. She readily consented, and staid but three days with us, during which time I pursued my usual course of treatment, giving her things to remove the canker, and steaming to promote a natural perspiration; and at the end of the time she went home, taking with her some medicine, with directions how to manage herself, and in a short time entirely recovered her health.

Soon after this, Mrs. W. had another child, which was her

last. She did extremely well, and never had another attack of the colic. Notwithstanding she was restored so soon, the family were hardly willing to give me any credit for the cure, or acknowledge that I had benefitted her; and in time of sickness they never would send for me, until all other remedies had failed.

SICKNESS OF A SON OF MRS. WETHERBEE.

In about one year after this, a young man, one of this family, about 16 years of age, was taken with a fever, and it was not time for me to be employed, consequently the physician was called in as usual, and reduced him with Mercury and other poisons, to that degree that he lingered several months, growing constantly worse, and the doctor said he had the rheumatic fever, and afterwards that he was in a decline or consumption. The mercury had settled in his back and hips, and he was so stiff that he could not bring his hands lower than his knees. The doctor now gave him over to die—consequently he was a fit subject for me.

DR. THOMSON SENT FOR.

His parents as usual called upon me, and out of pity for the young man I agreed to take him home to my house, and to do the best I could for him. It was a difficult task, for I had to bring him back to the same situation he was in when he had the fever, and destroy the effects of the poison, and regulate the system by steaming, to produce a natural perspiration. By pursuing this plan, and giving such articles as I could obtain to restore the digestive system, in two months he was completely restored to health. For this service I received five dollars, and that was more grudgingly paid than the fifty dollars paid the doctor for making him sick.

A CASE OF CONSUMPTION.

In the spring of 1805, I was sent for to go to Woodstock, in Vermont, to attend a young woman who was considered in a decline, and was given over as incurable by the doctors. I attended her about one week, and then left her medicines and started for home. In about one month I visited her again, and found her so much better that she was able to ride to her father's, which was a distance of about twenty miles.

DIFFIDENCE OF DR. THOMSON.

All this time I did not think that I possessed any knowledge of disease or of medicine, more than what I had learned by accident, and all the cases I had attended were from necessity. At any rate the success attending my practice created much talk and it was known for fifty miles around the country, and I was so constantly harrassed that I found it impossible to at-

tend to my farm and family as I ought. For the cases I had attended I had received very little compensation, not sufficient to pay me for my time, and I found it to be my duty to give up practice entirely or to make a business of it.

CONSULTS ABOUT CONTINUING HIS PRACTICE.

"I consulted with my wife and advised with my friends what was best for me to do, and they all agreed that as it seemed to be the natural turn of my mind, and if I thought myself capable of grappling with so important an undertaking, it would be best to let my own judgment govern me and do as I thought best, I finally concluded to improve the talent which the God of nature appeared to have endowed me with for the good of mankind.

IDEAS OF HIS RECEIVING AN EDUCATION.

"Whether I should have been any more useful, had it been my lot to have been educated, and learned the profession in the regular and fashionable way, I cannot say; but am inclined to think my usefulness would in a great measure have been destroyed, as my mind would then have been guided by the acquired knowledge of others, instead of reason and philosophy which I took for my criterion, and by which I was never deceived.

TALENTS OF EDUCATED AND UNEDUCATED MEN.

"I wish my readers to understand that I do not intend to convey the idea that learning is not necessary and essential in obtaining a knowledge of any profession; but that going to college will make a wise man of a fool is what I am ready to deny. Or that a man cannot be useful and even eminent in his profession, or in the arts and sciences, without a classical education, is what I think no one will have the hardihood to deny, as it is contrary to reason and common sense; as some of the greatest philosophers, statesmen, physicians and divines of the world were self-taught; and who have done more good and rendered society more happy by their knowledge than a million of those who have nothing to recommend them but a head stored with artificial knowladge to the exclusion of more rational and solid information acquired from a useful employment."

USE OF POISONS, &C. CONDEMNED BY THE FACULTY.

Among the practising physicians I have found, I believe it a well known fact, that those who were really great in their profession and have had the most experience, condemn as much as I do the fashionable practice of the present day. Such physicians use but very little mercurial poison, but confine themselves in their treatment mostly to vegetable simples and the

use of such things as will promote digestion and assist nature; and many of late years disapprove entirely of bloodletting and depletion generally. This is a great point gained in the practice of medicine. I have become acquainted with many physicians that were eminent in their profession, who have treated me with civility and have heard a relation of my experience with apparent pleasure, especially the simple relation of my method of treating disease.

THE GREATEST ABUSE RECEIVED WHERE THE MOST GOOD WAS DONE.

The greatest abuse I have ever received was where I had cured the patients that were given over by the doctors to die, as in such cases no abuse has been spared or ridicule wanting, that would in the least forward their object in destroying the confidence of the people in me and my practice.

DETERMINES TO FOLLOW THE PRACTICE.

After I had come to the determination to make a business of the medical practice, I found it necessary to fix upon some system or plan for future government in the treatment of disease; as what I had done has been as it were from accident, and the necessity arising out of the particular cases that came under my care, without any fixed plan. I deemed it necessary not only as a guide to myself, but that whatever discoveries I should make in future in my practice might be so adapted to my plan that my whole system might be easily taught to others, and preserved for the benefit of the world. I had no other assistance than my own observation and the natural reflections of my own mind unaided by learning or the opinions of others. I took nature for my guide, and experience for my instructor, and after considering every part of the subject I came to certain conclusions concerning disease, and the whole animal economy; which more than forty years' experience has perfectly satisfied me is the only correct theory. My practice has been invariably conformable to the general principles upon which my system is founded, and in no instance have I had reason to doubt the correctness of its application to all diseases incident to the country, when properly applied, that are curable.

THOMSONIAN THEORY.

That all diseases are the effect of one general cause and may be removed by one general remedy, is the foundation upon which I have erected my fabric, and which I shall endeavor to explain in as concise a manner as possible, that my readers may understand and be convinced of its correctness. I found that all animal bodies were composed of the elements, and that earth and water were the solids, and air and fire or heat were the fluids, and a proper organization and a

suitable temperature produced life and motion; that cold or measurably the absence of heat was the cause of disease, that to restore the heat or animal warmth to its natural standard was the only way that health and strength could be produced; and that after restoring the natural heat of the body by clearing the system of all obstructions, and causing a natural perspiration, the stomach would digest the food taken, by which means the whole body is nourished and invigorated and the heat of the body or nature is able to hold its supremacy. I found that the constitutions of all mankind were generally the same, and differing only in the temperament of the same materials of which they were composed. It appeared also clear to my mind that all disease originated from one general cause, and might be cured by one general remedy or principle, applied in a great variety of forms as medicine; and that a state of perfect health arises from a due balance or proper temperature of the elements; but if by any means this balance or equilibrium is destroyed, the heat of the body is wasted and more or less diseased. This is always the case in a partial absence of the active element or heat, or in proportion to this diminution or absence the opposing principle, or cold, is received into the system, producing derangement and disease.

COMMON ORIGIN OF DISEASES.

I found that all diseases to which the human family were subject were, however various the symptoms and different the names by which they were called, produced directly from obstructed perspiration, which is always produced by cold or the absence of a suitable degree of natural vitality, or warmth above the temperature of the atmosphere; for upon the *head* and *fall*, as an engineer or miller would say, depends the movement of the machine, or life and motion in the human body; and if there is a natural heat, there must be a natural perspiration.

GENERAL REMEDY.

Having fixed upon these principles as the only solid foundation upon which a correct and true knowledge of the subject can be based, my next business was, what kind of medicines and treatment would best answer the purpose, in conformity to this universal plan of curing disease.

It must be self-evident, I think, to every one, that whatsoever course will restore or increase the natural internal warmth of the body, if not to exceed 100 deg. Fahrenheit, or the temperature of the blood, and remove all obstructions of the system, restore the powers of digestion, and promote a natural perspiration, is universally applicable in all cases of disease, and therefore may be considered as a general remedy.

EMETICS—INTERNAL HEAT OF THE BODY.

The first and most important consideration was to find a medicine that would establish a natural internal heat, so as to give nature its command over the body. The emetic herb (No. 1) *Lobelia inflata* I found would effectually cleanse the stomach, and aid in raising the heat and promoting perspiration; but the system would not hold it a sufficient length of time to effect the desired object. It was like a fire made of shavings—a heat for a short time, then it would go out.

After much trouble and experience, and trying every thing within my knowledge, I at length fixed upon the medicine which I have called No. 2, Cayenne pepper (or capsicum), for that purpose; and after many years experience in its use, I am perfectly convinced that it is the best thing that can be used to hold the heat in the system until the stomach and various avenues of the body are cleared of their obstructions, so as to produce a natural digestion of the food which will nourish the body, establish perspiration, and restore the health of the patient. I found it to be perfectly safe in all cases, and have never known any bad effects to arise from its use.

A CURE FOR CANKER.

My next grand object was to get something that would clear the stomach and bowels from canker, or the white feverish coat that was attached to the mucous membrane, which is more or less affected by it in all cases of disease to which the human family are subject. Canker and putrefaction are caused by cold. or want of heat; for whenever any part of the body is so affected with the cold as to overpower the natural heat, putrefaction commences; and if not checked by medicine, or if the natural constitution is not strong enough to overcome its progress, it will communicate with the blood, when death will end the contest between the heat and cold, or the powers of life and death, by deciding in favor of the latter. In this case, too, as in the others, I have used a great variety of articles which are useful in removing this feverish coat or canker; but my preparation called No. 3, is the best for that purpose of any remedy that has come within my knowledge, though many other things may be used to good effect, which will be described in their appropriate place, under the head of compounded medicines.

GENERAL TREATMENT OF THE SICK.

My general plan of treatment has been in all cases of disease to cleanse the stomach by giving an emetic, or No. 1, and produce as great an internal heat as I could, by the use of Cayenne pepper, or other stimulants under the head of No. 2; and when necessary made use of the steam bath, in which I always found a great benefit, especially in fevers. After this I gave a tea made

of a compound of bayberry, sumac, hemlock bark, witch-hazle leaves, red raspberry leaves, and marsh rosemary, or a combination of any two or three of them, as directed under the head of No. 3 (see directions), to clear off the canker; and in all cases where the patient had not become so low that the constitution had nothing left to build upon, I have been successful in restoring them to health.

OBSERVATIONS ON FEVER.

I found that fever was a disturbed state of the heat, or animal warmth, or more properly, that it was caused by the efforts which nature makes to throw off disease, and therefore ought to be treated as a friend, and not as an enemy, as in the practice of the regular physicians.

ALL FEVERS PROCEED FROM THE SAME CAUSE.

In all cases of disease, I have always found there is more or less fever, according to the state of the system; but that all fevers proceed from the same cause, differing only in the symptoms, and may be managed and brought to a crisis with much less trouble than is generally considered practicable, by increasing the internal heat or temperature of the body, until the cold is driven out, together with the cause of it. Thus, by keeping the fountain above the stream, every function will take its natural course, and free the body of every obstruction.

YELLOW FEVER IN WALPOLE.

In the year 1805, a very alarming disease broke out in the towns of Walpole and Alstead, which was considered the yellow fever, and was fatal to many who were attacked with it. I was called on, and attended with very great success, not losing one patient that came under my care, while at the same time nearly one half of those who had regular physicians died. This disease prevailed for about forty days, during which time I was at home but eight nights.

UNREMITTED ATTENTION—IMPROVEMENT IN PRACTICE.

I was obliged to be nurse as well as doctor, and to do every thing myself, for the people had no knowledge of my mode of practice, and I could not depend upon what any person did except what was done under my immediate inspection. I pursued the same general plan that I had before adopted, but the experience I had from this practice suggested to me many improvements which I had not before thought of, as respects the manner of treatment of patients, to effect the object I aimed at in curing the disease, which was to produce a natural perspiration.

BENEFIT FROM STEAMING.

I found great benefit from steaming in the manner I had discovered, and practised in the case of my little daughter; but I found that putting a hot stone into a spider or iron basin, and then wetting the top of the stone with vinegar, was an important improvement; and this simple method, with a little medicine of my own preparing, answered a much better purpose than all the bleeding, poisons, or physic, of the doctors.

INGRATITUDE OF CURED PATIENTS..

While I was attending those who were sick, and relieving their distress, they were ready to flatter, and give me great credit for my practice; but after I had nearly worn myself out in their service they began to think it was not done in a fashionable way; and the doctors made use of every means to ridicule my mode of treatment, for the purpose of more successfully maintaining their credit and ascendency with the people. This kind of treatment I did not then understand so well as I do now; as I have since learned from hard experience how to appreciate reports of doctors, when excited on account of the restoration of their old abandoned patients to health, by one who does not believe or practice in their peculiar way.

CALLED A QUACK.

The words quack and quackery, when used by the doctors against me had a very important charm to prejudice the people against my practice; but I would ask the candid and reflecting part of community, which is the greatest quack, the one who relieves their infirmities by simple and safe means, or he who administers poisons and breaks down the constitution of the patient, and leaves death to relieve them from pain, and to finish the cure scientifically.

CASE OF FAIRBANKS—BLEEDING AT THE LUNGS.

I was called upon to attend a man in Walpole, by the name of Fairbanks; he was taken with bleeding at the lungs. I found him in a very bad condition; the family judged that he had lost nearly six quarts of blood in twenty-four hours. He was in despair, and had taken leave of his family, as they considered there was no chance for his living. The doctor was with him when I first entered the house, but he immediately left. I found the patient with both legs corded, and the first thing I did was to take off the cords, and leave what little blood there was to circulate freely, and then gave him medicine to procure as great an internal heat as I could possibly produce. I procured a lively perspiration to start from every part of the body, and then gave him medicines to clear away the canker, and in four days he was so well as to be able to go out and attend to his business.

CHILD-BED FEVER—CONSUMPTION—CANCER.

In October of the same year, I attended a Mrs. Goodell, of Walpole. She had been confined, and had taken cold. The most noted doctors in town had attended her through what they called a fever, and she was then pronounced by them to be in a decline. After three months' attendance, they said she was so putrid and ulcerated that it was utterly impossible to cure her. She had, in addition to her other difficulties, a cancer on her back. In this desperate situation, it was thought by her friends that she was a proper subject for me to undertake with. At the earnest solicitation of her husband I undertook her case, and met with much better success than I expected—as in four weeks she was able to be about house, and do some work.

CASE OF DROPSY.

In the same year, I was sent for to attend a woman who had been in a dropsical way for a number of years. The disease had of late gained with great rapidity. The doctors had tried mercury, which had very nearly proved fatal to her; for I was sent for in great haste, with a request that I would attend as quick as possible, as they did not expect the patient would live through the day. I found her in a very distressed situation. She said it appeared to her as if she was full of scalding water. She began to turn purple in spots, and it was expected that mortifiication had taken place. In the first place, I gave her about a gill of chickberry and hemlock distilled, which allayed the heat immediately. This answered the purpose until I could clear her stomach, and by the greatest exertions and the closest attention through the day, I was enabled to relieve her. I attended her for about one week, and she was so far recovered that she enjoyed comfortable health for twelve years.

INGRATITUDE OF PATIENT'S FRIENDS.

Notwithstauding this desperate case was cured, to the astonishment of all, the doctors had so much influence over the people, and made so many false statements, that I got no credit for the case. The woman's brother said that her husband wanted to kill her, or he would not have sent for me. Such ingratitude was discouraging, but it did not prevent me from doing my duty.

UNEXPECTED PATIENT.

A short time from this, the woman's brother, who had made the speech about me, was taken sick, with what was called the yellow fever, and sent for me. I attended, and asked him if he wanted to die. He said, no—why do you ask me that? I told him, the language which he had used respecting my attending his sister, led me to suppose he wanted to die, or that he never

would have sent for me, if he had believed his own words. He said he felt different now. I attended him through the day.

NEW METHOD OF STEAMING.

To sweat him, I took hemlock boughs, and put a hot stone in the middle of a large bundle of them, wrapped the whole in a cloth, and poured on hot water until I raised a lively steam, and then put one bunch to his feet and another near his body. I gave him medicine to raise the inward heat, and for the canker. After attending him through the day I went home, and on calling to see him the next morning, found his fever had turned and he was quite comfortable, so that he was soon about his business.

CASE OF A CHILD.

I was sent for about this time to go to the town of Surry, to see a child which was taken very sick, and was entirely stupid. I told the father that the child had the canker very bad, but I soon relieved it with my usual treatment.

TWO CASES OF FEVER.

Being sent for to go to Walpole, to see two young men who had been taken two days before with the prevailing fever, I left the child, with directions for his parents how to proceed with it. I found the young men laboring under violent attacks of the fever. They had a brother who had been attended by the doctor for the same complaint for four weeks, and was just able sit up. It was thought by those who witnessed the attacks that the last were as violent cases as the other, and they expressed a strong desire that the young men might not be kept down as long as their brother was. I was as anxious as they were for a short job, and exerted all my powers to relieve them, which was accomplished that night, and I left them in the morning, quite comfortable, and they were soon able to attend to their work. The brother who was attended by the doctor was not able to do any labor in several months.

NO COMPENSATION RECEIVED.

The doctor was paid a heavy bill, but my cure was done so quick that it was not thought worthy of notice, and I never got one cent for my trouble.

RETURN TO THE CHILD.

On returning to the child I left the day before, I found that the doctor had been there, and told them I did not know what was the matter with the patient, and persuaded them to give him the care of it. He filled it with mercury and run it down; after having given as much mercury inwardly as nature would bear, and the bowels grew silent, he then rubbed the mercurial ointment over the exterior surface of the bowels as long as it

would absorb, after which he agreed that the child had the canker very badly; but he still persisted in the same course of treatment, until the child wasted away and died, in about two months after it was taken sick. After the child was dead, its parents were willing to allow that I understood the disorder best. The doctor got twenty-five dollars for killing the child, but I got nothing for relieving it.

EXTRAORDINARY CASE.

There was brought to my house in 1805, a Mrs. Richardson, from Westford, Vermont. She was brought all the way in her bed, a distance of 130 miles, and was attended by her son and daughter, the one twenty-one and the other eighteen years of age. The mother had lain in her bed for the most part of the time for ten years. The best physicians in that part of the country had been employed without advantage, and they had spent nearly all their property. I undertook with her more from a charitable feeling for the young man and woman than from any expectation of a cure.

The young man stated that his mother had been for a year together without opening her eyes; that when she could open them, they thought her almost well. She was perfectly helpless, not being able to do the least thing, not even to brush off a fly from her face, any more than an infant. She had lain so long that her knee joints had become stiff.

TREATMENT OF MRS. RICHARDSON.

I began with her by cleansing the stomach and promoting perspiration, after which I tried to give her some exercise. The first trial was made by putting a bed upon a wheel barrow and laying the patient upon it, when I would run her about until she appeared to be weary. Sometimes I would make a misstep and fall, pretending that I had hurt me, in order to try to get her to move herself, by frightening her. After exercising her in this way for a few days, I put her into a waggon, sitting on a bed, and drove her about in that manner, and when her joints became more limber I sat her on the seat of the waggon. She insisted that she should fall off, for she said she could not use her feet; but the driver would sometimes drive on sideling ground, and rather than turn over she would start her feet unexpectedly. After exercising her in this manner for some time, I put her on a horse behind her son. She at first insisted that she should fall off; but when I told her she was at liberty to fall if she chose, she would not, and would rather exert herself to hold on. When she had rode in this way a few times, I put her on a horse alone, and after a few trials she would ride very well, so that in the course of two months she would ride four miles out and back every day. She used to be tired after riding,

and would lie down, and apparently would not move for six hours together. I continued to give her medicine, to keep up a perspiration and to restore the digestive powers and strengthen the nervous system.

RETURNED HOME, WELL.

I attended her in this way for three months, and then went with herself and children to Manchester. She rode upwards of 30 miles in a day, and stood the journey well.

USUAL PAYMENT.

I never received a cent for the trouble and expense of keeping them for three months; but I accomplished what I undertook, and relieved those two unfortunate orphan children from their burthen, which was more satisfaction to me than to have received a large sum of money without doing any good. I saw this woman three years after, at the wedding of her son, and she was quite comfortable, and has enjoyed her health in a tolerable degree to this time (1822, date of the 1st edition,) being able to wait upon herself.

A CASE OF FITS.

On my return from Manchester, I stopped in the afternoon at a meeting in Walpole (it being Sabbath), and during the service a young woman was taken in a fit, and carried out of the church. I went out to see her, and found that she had been subject to fits for some time. She was much bloated and very large, weighing about three hundred. A few days after, her friends brought her to my house, and were very urgent that I should undertake to help her; but I told them that I was satisfied that it would be a very difficult undertaking, and that I did not feel willing to engage in it; but they were so urgent that I undertook to do what I could for her.

EFFECT OF MEDICINE—AND OF PERSPIRATION.

Every time she took medicine, when I began with her, she would have a strong convulsion fit; but I soon got her to sweat profusely, and her fits were at an end. By persevering in my usual way, I established a natural perspiration, and her other evacuations became regular; she was reduced in size, and I have never heard of her having fits since.

CAUSE OF HER FITS.

The cause of her fits was taking a sudden cold, when all perspiration and the greater part of the other evacuations ceased.

DYSENTERY AND CANCER.

In the fall of 1805, I was sent for to go to Richmond, to see the family of Elder Bowles, who were all sick with the dysentery; and Mrs. Bowles had a cancer on her breast. I relieved

them of their disorder by my usual mode of practice, and gave the woman medicine for the cancer, which relieved her also.

CANCER DISSOLVED.

I had occasion to visit her again, and the tumor was about the size of an egg; but by following my directions it was dissolved without causing any pain, and she has been well for twelve years.

SPOTTED FEVER—STEAMING BY DOCTORS.

I then practiced in Royalton and Warwick, and in my usual way of sweating for the spotted fever, which became known and was practiced by the physicians in Petersham.

CANCER—HOW TREATED BY DOCTORS.

After returning home, I was sent for to attend a woman in the neighborhood, who had been under the care of a celebrated doctor for a cancer in her breast. He had tortured her with his caustics until her breasts were burned through to the bone, and by its corrosive nature had caused the cords to draw up into knots. He had also burned her leg to the tendons. She had been under his care eleven weeks, until she was much wasted away, and her strength nearly gone.

TAKEN CHARGE OF—CURED.

In this situation, the doctor was willing to get her off his hands, and wished me to take charge of her. I consented and took charge of her, and in three weeks healed up her sores and cleared her of her humor so effectually that she has ever since enjoyed good health.

ANOTHER LADY RESTORED.

While attending her, I cured a woman from Hillsborough, who had a cancer on her neck. I dissolved the tumor and cured her, by the use of the cancer balsam and the common course of medicine, and she has enjoyed good health ever since.

SUPPOSED CASE OF POISON.

I attended the funeral of a young man who had been attended by a physician in the town of Alstead, who had lost about sixty patients in the town in a short time. The corpse was badly swelled, so that it was difficult to screw down the lid of the coffin. This patient had not been sick but about twenty-four hours and but twelve under the effects of the medicine of the doctor. When I went into the room where the corpse was the doctor followed me and gave directions to have the coffin secured, so as to prevent the corpse from being seen, and then began to insult me to attract the attention of the people. He said to me I understand you have a patent to cure such disorders as that, pointing to the corpse. I said no. and then inti-

mated what I thought of him. He put on an air of great importance and said to me, what can you know about medicine. You have no learning; you cannot parse one sentence of grammar. I replied that I did not know that grammar was made use of as medicine; but if the operation of a potion of grammar produce symptoms so nearly like those of ratsbane as what appears in this corpse, I have no inclination to know the use of it. This unexpected use of the meaning of what he said displeased the medical gentleman very much, and finding that many of the people present had the same opinion that I had, irritated him so very much that he threatened to horsewhip me, but I told him he might do what he pleased provided he did not poison me with his grammar. He did not attempt to put his threat into execution, so I have escaped both his whip and his grammar. I have been more particular in relating these circumstances in order to show my reasons for refusing to practice so near home for I had been in constant employment among the people in my neighborhood and the adjoining towns and country for four or five years, and had been very successful, not having lost one patient during the whole time. My house had been constantly filled with patients from all parts of the country, for which I had received little or no compensation for my services. Myself and family were broken down and worn out with nursing and attending to them night and day, so that I was obliged to leave home to free myself and family from so heavy a burthen. Besides, I felt it more a duty to attend the people in those parts where I had been treated with the most kindness and friendship and had received the most assistance in a pecuniary point of view, than where I had received little from those whom I considered under the greatest obligations to me.

VISITS NEW YORK—THE YELLOW FEVER, ETC.

In 1806 I went to New York for the purpose of ascertaining the nature of the yellow fever, and on my arrival put up with a Mr. Kavanagh a Roman Catholic, and I soon had a chance to try the yellow fever. I was employed to attend a Mr. McGowan, who had the yellow fever. He was the teacher of the Roman Catholic school and an acquaintance of Mr. Kavanagh with whom I boarded and who recommended him to my care. He was attacked about noon, was very cold, and had no pain: his eyes were half closed, and he appeared like a person half way between sleeping and waking; he lost so much strength in two hours that he was unable to walk across the room without staggering.

TREATMENT OF YELLOW FEVER.

I began by giving him Nos. 2 and 3, to raise the internal heat and to clear the stomach, and in one hour after getting

him warm he was in extreme pain, so that his friends were alarmed about him; but I told them it was a favorable symptom. After being in this situation about one hour, perspiration started, and the next day he was out about his business.

The effect in this case was precisely similar to a person's being recovered after having been drowned. The balance of inward warmth above that of the external atmosphere having been lost, the sensation of feeling ceases, and of course there is no pain. But as soon as the vital warmth begins to gain the ascendancy so as to contend with the cold successfully, sensibility returns, then the pain and distress commences, and will be very severe until the victory is fully established, and the surplus of vital warmth is restored.

MANY CASES CURED.

While there, I attended a number of cases, with similar success.

FEVER AND AGUE—INGRATITUDE.

While in New-York, I attended an Irishman by the name of Doyle, who had the fever and ague. This disease gives a complete view of my theory of heat and cold, for it is about an equal balance between the two, the heat keeping a little the upper hand. This man had been affected for four months; he had the fits very bad daily. I commenced by giving such medicines as I usually give to increase the heat of the body, and subdued the cold, thus establishing the surplus of vital warmth, and by strictly attending him four days he was cured. Being short of money, I asked him for some compensation for my trouble, but he refused, and never paid me a cent. He said he must have been getting better before, for no one ever heard of such a disorder being cured in four days.

FRIENDSHIP IN ADVERSITY.

A gentleman by the name of Quackenbush, who had the care of the states prison, learning how I had been treated, invited me to go and tarry with him while I remained in the city, for which privilege I felt very thankful. I was treated with much kindness by himself and family, for which they have my most sincere thanks.

RETURN HOME.

On the 16th of September I started for home, and arrived after three months' absence. After my return I was frequently called upon to attend the sick, but generally declined on account of the treatment received, as before related, in relation to pay.

COMMENCES COLLECTING MEDICINE.

In November I went to Plumb Island to collect medicine. I

went by the way of Newburyport, and after being on the Island three or four days and procuring the requisite quantity, I again returned to that place.

SUCCESSFUL PRACTICE.

While I was there in a store in conversation with several individuals, there came in a man from Salisbury Mills, by the name of Osgood, who stated that he was unwell, and that his wife lay at the point of death with the lung fever. He said that she had been attended by one Dr. French, who had given her over to die. One of the gentlemen present told him that I was a doctor and used the medicine of our own country. He asked me if I would go home with him to see his wife, and I told him I would, and we immediately started in his chaise for home, which was about six miles. On arriving at his dwelling I was introduced to his wife as a Botanic Doctor and he asked her if she was willing that I should undertake to cure her, and she said yes, provided I thought there was a chance. I commenced with her in my usual way, and in about fourteen hours her fever turned, and the next day she was comfortable and soon got well.

PUBLIC SENTIMENT.

This cure was much talked of in the neighborhood and was much thought of by the people. But it soon came to the ears of Doctor French who was much enraged to think that one of his patients who had been abandoned as incurable should be cured by one whom he called a quack. He said she was getting better before I saw her, and that she could set up during the day, all which reports were promptly denied by Osgood and his family.

FURTHER SUCCESS.

While I was waiting for a team which I expected to carry home the medicines I had procured, I was called to attend several cases in all of which I was successful, and most of them were such as had been given over by the doctors to die. One of the cases was a young man who had cut three of his fingers so badly as to lay open the joints. Dr. French had attended him three weeks and he was then so bad that he advised that he should have them cut off as the only alternative. The young man applied to me. I told him that if they were mine I should not be willing to part with them at present. He requested that I would undertake his case, which I did, and commenced by clearing the wound of mercury and washing it with weak lye. I then put on some drops and did up the hand with a bandage which was kept wet with cold water. While I was dressing his hand Doct. French's student came in and told the young man that I should spoil his hand, but I told him I was ac-

countable for what was then doing, and he left immediately, telling the patient that Doctor French's bill must be paid forthwith. In ten days the young man was well and at work in a nail factory. I asked him what Doct. French had charged him and he said seventeen dollars. I told him that I thought that a sufficient charge for us both, and should charge him nothing. His mother was a poor widow depending on her own exertions and that of her son for a living. I soon after returned home to the great disappointment of many who wished my assistance.

VISITS VERMONT—CASE OF FITS, ETC.

In the winter of 1807 I went to Jericho, Vermont, to visit my father's family who resided there. While I was there I was called to see a number who were sick. Among them was a young man who was taken with cramp convulsion fits. He was taken on Sunday and continued until Tuesday. He was attended by the best doctors in that vicinity without doing him any good. They could not make their medicine operate, and the most part of the time he was as stiff as a graven image. He was at length given over to die. Now came my turn of course. The father came for me, and just as we entered the room he went into a fit. His feet and hands were drawn towards his body; his jaws were set; his head drawn back; and every part of him as completely fixed as a statue. The first difficulty was to get him to take medicine, for his jaws were set as tight as a vice. I took a solution of No's. 1, 2, and 6, as strong as it could be made, then put my finger into the corner of his mouth between his cheek and teeth, and poured some of it in as well as I could, and as soon as it touched the glands at the roots of the tongue his jaws came open and he swallowed some of the medicine, which had such an effect upon the stomach that all the spasms left. I left him some medicine with directions for its use, and he soon entirely recovered his health. I saw him three years after and he told me he had never had a fit since. I was convinced from this case that the cause of all cramps or spasms of this kind were seated in the stomach, and that all applications for relief should be made there, as it will be of no service to work on the effect while the cause yet remains.

CASE OF FEVER SORE.

I was also called to see the son of Capt. Lyman of Jericho, who had been afflicted with a fever sore for seven years. All the doctors in those parts had a hand at him. It was their opinion that the thigh should be laid open and the bone scraped. I told him I did not see how that could be done without injury to the great artery, (*femoral*,) which lay close to the

bone where they must cut. He was satisfied it would not do, and wished me to attend him. I told the father that it was impossible for me to stay there and attend him, but if his son wanted to go home with me I would make a trial of what I could do for him; to which they all consented, and the young man went home with me. I began by giving him medicines to correct and strengthen the stomach and digestive system: bathing the sore with rheumatic drops, sometimes bathing with cold water to strengthen the leg, and after proceeding in this manner about one month, he was sufficiently restored to do some work. He remained with me until August when he was entirely cured, so that he was able to return to his father's on foot, a distance of one hundred and thirty miles.

GREAT SUCCESS IN DYSENTERY.

In the fall of this year, (1807,) the dysentery or camp distemper as it was called became epidemic in Jericho, and was attended with such fatality that all except two who were attended by the doctors had died, having lost about twenty in a short time. The inhabitants were much alarmed and held a consultation what was best to do, and being informed by young Lyman that I was at home, they came to the conclusion to send an express after me, which was done, and I immediately made arrangements to comply with their request. In twenty-four hours after I started, and arrived there on the third day after, and found them waiting with great anxiety for me, the sick having refused to take any thing further from the doctors. I had an interview with the select men of the town who had taken upon themselves the care of the sick. They informed me that there was then about thirty sick, who wished my assistance. I agreed to take charge of them, on condition that I could have two men to assist me. This was complied with, and I commenced my practice upon thirty in the course of three days. The disorder was the most distressing of any that I had ever witnessed. One man had been speechless for 6 hours, and was supposed to be dying; but on my giving him medicine to warm him, he seemed to revive, like an insect that had been warmed by the sun after having laid in a torpid state through the winter.

INVENTS MEDICINE, AS REQUIRED.

I had but little medicine with me, and had to use such as I could procure in the place.

CAUSE OF THE DISEASE.

I found the cause of the disease to be coldness and canker; the digestive powers being lost, the stomach being deranged so that the system could not hold the heat.

CANKER MEDICINE, ETC.

I made use of red peppers steeped in sumac tea, sweetened, and sometimes the bark and berries, to raise the heat and scour off the canker, which had the desired effect. After taking this tea, those who were strong enough I placed over a steam as long as they could bear it, and then put them in bed. Those who were too weak to stand, I managed to have set over a steam, and repeated as often as occasion required.

SYRUP FOR DIGESTION.

To restore the digestive powers, I made use of cherry stones. I pounded them fine, and then made a tea of black birch bark and put in the cherries, and made a syrup, by puttimg from two to three ounces of sugar to one quart of the liquor; this was given freely, and answered a good purpose.

TOWN CLEARED OF THE DISEASE IN EIGHT DAYS.

I continued to attend upon my patients, aided by those appointed to assist me, and in eight days I had completely subdued the disease. The patients all recovered except two, who were dying when I first saw them.

MEDICINE TO NURSES.

I gave the same medicine to the nurses and those exposed to disease, as well as to those that were sick, which prevented them from having the disorder: for the same remedy that will cure disease will prevent it.

ATTENDANCE IN GEORGIA.

After finishing my practice in this town, I was sent for to go to the town of Georgia, about thirty miles distant, where I practiced with general success for one week, and then returned to Jericho. Those patients I left were comfortable, and soon entirely recovered.

DUE CREDIT GIVEN.

The doctors were not well pleased on account of my informing the people how to attend themselves; and they have never required their assistance in that disorder since. Due credit was awarded me for my medical services in this place.

SPRAINED ARM.

About this time I was called to see a young man in the town of Bridgewater, Vt., about 18 years of age, who had lost the use of his arm by a strain. It had become perfectly useless, and he carried it in a sling. His health was also bad. As I could not stay to attend him, he was carried to my house. I began with him in my usual way, by warming the stomach and restoring digestion, and bathed his arm with the oil of spearmint, and in

about ten days he was sufficiently restored to use his arm and do some work, and in two months he returned home, entirely cured.

RHEUMATISM CURED.

In the spring I returned to Salisbury, agreeable to promise the preceding fall. On my way I stopped at Pelham. The man at whose house I staid insisted that I should go and see his father in-law, who had the rheumatism, having been confined to his bed for two months. I attended him three days, when he was able to walk some by the use of a cane; he was soon restored to health.

CASE OF CONSUMPTION—DOCTOR PRESENT.

While at this place, I was sent for to see a young woman, sick of a consumption. She had a long time been attended by a doctor, who seemed very willing for my advice. I carried her through with a course of my medicine, and the doctor staid to see the operation. He seemed well pleased with my system of practice, and gave me much credit, saying that I was the first whom he ever knew who could make his medicine do as he said it would.

OTHER CASES.

I was also sent for to attend several other cases of consumption, and various other complaints, in all of which I was successful.

RECEPTION AT SALISBURY MILLS—PRACTICE, ETC.

After stopping at Pelham several weeks, during which time I had as much business as I could attend to, I went to Salisbury Mills, where I was most cordially welcomed by my old patients, which I had attended the year before. I was called upon to practice here and at Newburyport, and my success was so great that the physicians and their friends appeared much alarmed, and they did all they could to injure me and destroy the credit of my practice with the people.

EFFECT OF CURES.

A considerable part of the patients that were put under my care were such as the doctors had given over, and their being cured by me had a bad tendency upon their practice, as it opened the eyes of the people, who began to examine and compare the two systems of practice in point of success; and it did not require a long time for them to judge and decide between the two systems of medicine.

PERSECUTION, INSULT, ETC.

Among the doctors who appeared the most inimical towards me, was a Dr. French, who used every means he was possess-

ed of to injure me in connection with his friends, one of whom sent for me to come and give a calf of his that was sick a green powder and a sweat. Knowing that his object was to insult me, I sent back word for him to employ Dr. French, as usual, and if he could not cure it, I would then attend and restore it, as I was in the habit of doing with the rest of his patients. It so happened that the calf died. Soon after, a son was taken very sick. In a few days another calf was found dead in the pasture, and about the same time his oldest son was taken sick. These things happened in such an unexpected manner, that it set this man a thinking of his abuse towards me, and his conscience condemned him, and he had the folly to believe it was all the effect of witchcraft, and wished to make his peace with me, and he sent word that if I would let his family alone he would never do or say any thing more to my injury. This treaty I readily assented to; his children soon after got well, and providentially it so operated upon him as to keep his slanderous tongue still in relation to me.

RETURNS HOME—SUCCESSFUL PRACTICE.

I soon after returned home, and was immediately sent for to attend the sick, and was generally very successful, when the dysentery and fever were most prevalent, never failing in any instance of giving relief, and completely putting a check to those alarming epidemics, which caused so much terror in many parts of the country.

RETURN TO SALISBURY—SICK RELIEVED.

In the year 1808 I went again to Salisbury Mills, and on my way stopped at Pelham, and relieved several cases.

On my arrival at Salisbury Mills, where I made it my home, I was immediately called upon to practice in the adjacent town and country. Many desperate cases came from different parts, which had been given over by the doctors as hopeless, such as humors, dropsies, mortifications, felons, consumptions, &c.

WONDER AT CURES.

Fevers were so quickly cured, and with so little trouble, that many were unwilling to believe that they had the disease. My practice gave general satisfaction, and was considered to be superior to all other systems known.

VIOLENT OPPOSITION.

Dr. French appeared to be much enraged at my success with his patients, and failing to destroy the confidence which the people had in me, he then attempted to frighten me by threats.

MEANNESS.

He would frequently cause me to be sent for in great haste

to attend some of his sick neighbors, but I saw through all his tricks, and avoided his snares.

GREAT WICKEDNESS.

It seemed that if he failed in destroying my reputation, he was determined to destroy me. Being one day at Salisbury village, in company with Jeremiah Eaton, of Exeter, whose wife was then under my care, for a dropsical complaint, I was sent for four times to visit a young man at the house of Dr. F. The last time, a man came on horseback in the greatest haste, and insisted that I should go and see him. I asked why Dr. French did not attend him. He answered that the young man had rather have me. Being convinced of a trick, I refused to go, and the man returned.

PLOT CONFESSED.

In a short time Dr. French came into the village, and Mr. Eaton asked him what was the matter with the young man at his house. He said nothing, and that he was as well as any body. Mr. Eaton then asked him why he caused me to be sent for so many times, and he said, to see if I dared to come into his neighborhood to doctor, for he said he would blow out my brains if I came upon his side of the river.

FRENCH ARRESTED.

Mr. Eaton and others of my friends considered my life in danger, and advised me to be on my guard. I had to pass his house both day and night, and it was not deemed safe for me to go alone; consequently I had some one to accompany me. I continued in this way several days, when, finding his malice against me as great as ever, I had him arrested and put under two hundred dollar bonds to keep the peace, and appear at the next court of common pleas. He appeared at court, was ordered to pay the costs, and discharged from bail.

NETTLE RASH—CURE.

Rev. Jabez True, of Salisbury, was afflicted with the nettle rash, or St. Anthony's fire. It was caused by fighting fire, about 25 years before, and he had been subject to breaking out ever since, which at times was very painful, as it felt like the stinging of bees, and would swell all over his body. The doctors could not relieve him. I told him that he had heated himself to that degree that there was nearly a balance of power between the outward and internal heat, and then cooling himself suddenly, the inward heat had fallen as much below the natural state as it had been above it before, and the only way to effect a cure was to bring him into the same state as he was in when fighting fire. He wished me to undertake his case. I carried him through with a course of medicine, and made use

of every means in my power to raise the inward heat, pursuing my plan with zeal for two days, when he became alarmed, and said he felt as if he should die, for he felt the same as when he was fighting the fire. I then kept him in that situation as much as possible, and it went down gradually, so as to hold a natural proportion of heat. I succeeded completely in effecting a cure, and he has enjoyed good health ever since.

CONSUMPTION CURED.

I attended his wife at the same time, who had been long in a consumption, and had been given over by the doctors to die. She was perfectly cured, and they were both in good health in 1822, and ready to testify to the truth of this statement.

CASE OF DROPSY.

A woman by the name of Lifford came to me at Salisbury Mills, and wished me to attend her. She was very poorly with the dropsy. I told her that I thought her case was very bad, and her chance was so slender for a cure that I advised her to go home. She left, as I supposed for home, but soon returned, and said she had found a place to board, and a young woman had agreed to nurse her. I undertook with her, as I could not well avoid it. I gave her some medicine and it operated favorably, and I then gave strict orders to the nurse to keep up a perspiration through the night; but she almost totally neglected her duty to the sick, for the sake of young company. On visiting the patient in the morning, I found my directions had been disregarded. The lady told me that the nurse had neglected her, and that she had got her feet out of bed; perspiration had ceased, and other symptoms appeared unfavorable. I attended her through the day, and did all I could to relieve her, but could not raise a perspiration again. She continued until about midnight the following night, and died. My hopes of doing her good were small, but I think that if she had not been neglected by the nurse there might have been a chance for her.

The loss of this patient caused great triumph among my enemies, and Dr. French tried to have a jury on the body, but he failed, for the case was too well known, and all cleared me of blame.

The nurse said that I had done all I could, and if there was any blame it ought to fall on her, and not on me.

PRIVILEGE TO KILL.

This fashionable doctor might lose half of his patients with impunity, but if I happened to lose one out of several hundreds of desperate cases, I was guilty of murder in their estimation.

MRS. EATON—OTHER CASES.

Mrs. Eaton, before mentioned, who was afflicted with dropsy, remained under my care about three weeks, and was reduced in size eight inches. She then returned to Exeter. I had several cases of dropsy and consumption from the same town, about this time, all of which were relieved. As soon as I could get my patients in a proper situation to leave, I went to Salisbury Mills and commenced practicing, and was applied to from all parts of the adjacent country. I had not as many to attend to as in some places, but they were all of the most desperate character, having been given over by the doctors to die, in all of which I had good success.

AN HONEST DOCTOR.

Many of those patients had been attended by one Dr. Shepherd, a very plain and candid sort of a man, who treated me with much civility. I well remember his first remarks to me after an introduction. "Well," said he, "what are you doing here, are you killing or curing the people?" I replied, "you must judge about that yourself." "Well," said he, "I will watch you, not for fear of your doing any harm, but for my own information; I wish you well, and will do you all the good I can." I always found him candid, friendly, and without deceit.

VISITED WITH DR. SHEPHERD—RHEUMATISM.

Dr. Shepherd once called upon me to visit one of his patients with him who had the rheumatism in the back and hips. The doctor had attended about two months, and said he had killed the pain, but his back was stiff, so that he could not bring his hands below the knees.

VISIT RETURNED IN 48 HOURS BY PATIENT.

I attended him about forty eight hours, and then went with him to see the doctor, which was half a mile. The doctor appeared to be much pleased to see him so well, and to have the use of his limbs, for he could stoop and use them as well as ever he could.

Dr. S. frequently came to visit Mrs. Eaton, and expressed much astonishment at the effect of the medicine upon her, as he considered the dropsy incurable.

On one occasion, after finding her so much better, (having been reduced in size over fifteen inches,) he expressed himself with much warmth, and said that he had never seen the like before, and wished me to inform him how it was done. "You know, doctor," said I, "that the fire having gone out the water had filled the body, and all I had to do was to build fire suffi-

cient to boil away the water." This reply pleased him very much, and he said it was a short way to do business.

FIRST CASE OF VENEREAL.

While practicing in Exeter, I had a patient (a woman from Portsmouth) who had the venereal, in consequence of a bad husband. She had been atttended for nearly a year by the doctors in Portsmouth, who had filled her with mercury for the purpose of curing the disorder, until the remedy was worse than the disease. Her case was alarming and very difficult; she was brought on a bed, being unable to sit up, and seemed to be one mass of putrefaction. I proceeded with her in my usual way of treating old disease where the system has become generally disordered, by giving medicine to promote perspiration, steaming to throw out the mercury and to restore the digestive powers, and in three weeks she returned home, entirely cured.

SECOND CASE—PERFECT CURE, ETC.

Another woman came to me from the same place, who had been sick five years, which had been in consequence of having had the venereal. The doctors had filled her with mercury, to kill the disease, as they called it, and left her to linger out a miserable existence.

When she stated the case to me, I felt very unwilling to undertake with her, apprehending that it would be very uncertain whether a cure could be effected, her disease had been of so long standing; but she insisted that I should not put her off. I at length commenced upon her, and after three weeks attendance she returned home, well; and in less than a year she had two children at a birth. Her last child previous to the twins was born eight years before.

DISEASE EASILY CURED.

This disease is very easily cured in its first stages, by a common course of medicine, being nothing more than a high stage of canker seated in the glands of the organs of generation; and if not cured, communicate with the glands of the throat and other parts. Under the fashionable treatment, there is more difficulty in removing the mercury from the body of one in this situation, than in curing a dozen who have not taken the poison.

CASE OF CONSUMPTION.

While in Exeter, a young man, son of Col. Nathaniel Gilman, who was in a decline, called on me for assistance. He was about fourteen years of age, and had been troubled with bleeding at the nose. The physicians had made use of such powerful astringents, with corrosive sublimate snuffed into the head, that the blood vessels seemed shrunk, and his flesh

had wasted away. I carried him through with a course of medicine, and gave an equal circulation of blood through the body, and stopped its course to the head; then raised a natural perspiration, restored the digestive system, and regulated the body generally, so that it might receive support from his food and not medicine.

PATIENT RESTORED, ETC.—FACULTY ALARMED.

In a short time he recovered his health, so that he commanded a company of the militia at the alarm at Portsmouth during the war. My success while at this place was very great, and gained me much credit among the people; but the faculty were alarmed, and made use of every artifice to prejudce the public against me.

SCALD-HEAD.

A son of John Underwood, of Portsmouth, was brought to me while at Exeter, who had what was called a scald-head. He had been afflicted with it for nine years. The doctors had been applied to, but to no purpose; and when the boy was brought to me, the father agreed to pay a generous price if I would cure him. I took charge of him, and pursued my usual course of treatment, and in three weeks he returned home well, and has not since had any appearance of the disease.

MORE INGRATITUDE.

This man never paid me one cent for this service, and in order to make a refusal to pay plausible, he turned against me and my practice, although he had acknowledged that I had saved the life of his son. He said much against me and my practice, and kept away many that might have been cured. At length he was taken sick himself, and applied to my agent for relief, and was restored to health.

VENEREAL PATIENT KILLED BY DOCTORS.

I was sent for to go to Portsmouth to see a young man by the name of Lebell, who was in a very dangerous situation, supposed by his friends to be in a dying state, having been given over by doctors Cutler and Pierpont at ten o'clock that morning. I arrived about two in the afternoon. He had been attended by the doctors for about a month, to cure the venereal. They had filled him so full of mercury that he had swollen all over with the poison. The doctors pronounced it the dropsy. His legs had been scarified to let off the water; the disorder had gained the ascendency, and his vigorous constitution had submitted.

OPINION OF CASE.

I at once pronounced his case to be a desperate one, and told

the French counsel who had the care of him that I could give no encouragement that I could do him any good, but he was very anxious that I should make a trial. I told him, the only chance was to raise a perspiration, and that twenty-four hours would determine his case, for he would be better in that time or dead.

PROMISED REWARD.

The idea of a perspiration caused him to urge me to try, and he said if I could effect it he would give me one hundred dollars—the doctors had tried a month and could not succeed. I gave him some medicine, then put on the clothes by degrees until he was shielded from the air, and he sweat freely in about one hour.

ANXIETY OF DOCTORS—PATIENT BETTER.

The two doctors were present, and astonished at my success; they walked the room, talked low, and then went out. I staid with him until six o'clock, and the symptoms appeared favorable; he sweat profusely, and spat much matter, tinged with blood. I told the nurse to keep him in the same situation until I returned, and then went away and was gone about one hour, and came back with Mr. Underwood.

OUTRAGEOUS TREATMENT.

When we came into the room we found that the doctors had taken him out of bed, and sat him in a chair and opened the windows to let a draft of cold air strike him. I told them that this treatment of theirs towards the man would cause his death, and that I should do no more for him, and should now consider him as their patient. It appeared they were in trouble because I had effected in one hour a perspiration which they had failed in doing in a month.

PATIENT FAINTS—DIES.

The man fainted before I left the room. I went home with Mr. Underwood, and left them to pursue their own course, and the man died before morning.

NO PAY—VILLANY OF DOCTORS.

I received no compensation for my trouble, for coming fifteen miles and returning on foot; and besides, afterwards these two doctors came forward and swore that I killed this man, notwithstanding they had given him over to die the morning before I saw him, and they had taken him out of bed as before stated.

On being informed that they designed to support a complaint against me, I obtained several depositions of persons who were knowing to the facts, to counteract their statements. On

finding that I was about to oppose them, they dropped the matter. I was informed that in their deposition they set forth that my medicine was of a poisonous nature, and if the patients did not vomit immediately they would certainly die.

YELLOW FEVER—PHYSIC INJURIOUS.

In September, 1808, I was called to Portsmouth to see Richard Rice, Esq., who was sick with the yellow fever. The reason for his sending for me was, that he had heard that I sweat my patients to death.

PREVIOUS TREATMENT.

He had conceived the idea, that if he could be sweated he should be better, but they would not allow him to keep warm; they kept the windows and doors open, and had scarcely any clothing upon his bed. No fire was allowed in the room, while he was shivering with the cold. The plan was to kill the fever, and to effect this the doctor had bled him, and told his sister that he had given him as much arsenic as he dared to, and if that did not answer he did not know what would.

PATIENT RELIEVED.

I began to give him medicine a little before night, and in an hour perspiration took place. He was so weak that he was unable to help himself. In the morning the doctor proposed to bleed him, but he was dismissed. I was with him until his symptoms were favorable, and then left him in the care of three persons in whom I could confide.

ATTEMPTS TO FRIGHTEN.

After I was gone, Dr. Bracket came into the room where the patient was, in a great rage, saying they were killing him, for the mortification would soon take place in consequence of keeping him so warm. He was asked by one present, in which case was mortification most likely to take place—when the blood was cold and thick, or when warm and thin? The doctor would not answer. Having failed in his plan with the nurses, he then tried to frighten the wife and relations; but it did not answer—they were satisfied with the treatment he was receiving.

PATIENT DERANGED—RELIEVED.

The patient was much deranged by spells, sometimes imagined himself a lump of ice; but by following my directions, and keeping up a perspiration, by morning he was relieved and had become sane. He had no pain, except in the lower part of his bowels, for which he wished a dose of physic. I opposed the physic, being confident that it would not do in so putrid a case.

PHYSIC GIVEN—CONSEQUENCES.

He was so urgent that I gave him a small dose, which operated very soon, and the consequence was, it reinforced the disorder, and threw him into the greatest distress. He asked for more physic, but I told him I would not give him any more, being convinced of the impropriety of physic in such a case; and I have never given any since. It checked the perspiration, and drew the determining powers from the surface inward, so that I had to go through with the same process again of raising the perspiration and vomiting, which was much more difficult than at first, and it was with the utmost attention and difficulty that I was able to keep off the mortification for twelve hours. All this was brought about by taking a small dose of physic.

DIFFICULTY RELIEVED.

I kept up the perspiration through Friday and Saturday, and on Sunday morning when I called to see him he was up and dressing. I asked him how he did, and he replied, "I am as strong as you are," and took me under the arm and carried me across the room. On Monday he was down on the wharf, attending to his shipping business.

REMARKS OF THE PEOPLE.

This case created much excitement with those by whom the facts were known. Some would say, how can this man be successful in practice, when he has no learning? (book knowledge.] Mr. Rice gave me much credit for this cure, and requested me to make his house my home while in Portsmouth.

THEORY EXPLAINED.

While here, I was introduced to Judge Alexander Rice, of Kittery, Maine, a gentleman of highly respectable standing in that vicinity. Like others, Judge Rice could not see how so valuable a discovery could be made by a man without an education. I explained the philosophical principles of my practice to him, showing him how every thing operated under the elements, and by one acting upon another causing motion; how fire, water and air, keep every thing in motion; how the temperament of the body by adding or diminishing the heat or cold would promote life or death. After hearing my explanation, he confessed that my natural medical talent was of more value than artificial learning.

CASE OF JUDGE RICE, ETC.

Judge Rice then made known to me his infirmities, and wished that I would take care of his family, and give himself and wife such information as would enable them to attend upon themselves in case of sickness. I carried some of their family through with courses of medicine, Mrs. Rice being very

active, and anxious to gain information, after which she undertook to manage the business. She was a sound woman in judgment, and fearless in advocating correct principles.

SALT RHEUM.

After Mrs. Rice had been satisfied with the utility of my practice, she wished me to attend her through with a course of medicine for a bad humor called the salt rheum, which she had been long afflicted with. She went through a few courses, which effected a complete cure.

GOUT.

Major Rice had been afflicted for a number of years with severe turns of the gout, and had in some instances been confined with it six months together, and for six weeks not able to sit up, and much of the time not able to lift his hand to his head.

PHYSICIANS' TREATMENT, ETC.

He had constantly been under the care of one of the most skillful doctors in that section of country, who would bleed, blister and physic him, until his strength was exhausted; after attending him in this way through the winter, they would tell him that he must wait until warm weather before he could get about.

OPERATION OF HIS DISEASE.

When the weather became warm, he would crawl out to the sunny side of the house, and in this way he gradually gained his health and strength. After this, he was afflicted with a violent burning in the stomach, which was almost as troublesome as the gout.

RELIEF EASILY OBTAINED.

After having a knowledge of my practice Major Rice never had an attack of the gout to last twenty-four hours before he found relief. The burning at the stomach troubled him but very little since he used this medicine.

VALUE OF MEDICAL KNOWLEDGE.

This gentleman has frequently told me, that if he could have been as sure of relief when he was first subject to this complaint, as he is now certain of it in twenty-four hours, he would have been willing to have given all he was worth. Money would be no inducement for this family to part with the knowledge of this practice, were it in their power to dispose of their information in relation to its virtues.

DYSENTERY.

I was sent for to go to Deerfield, where the dysentery pre-

vailed, and had proved very mortal. A young man by the name of Folsom came for me, and he said that the doctor had lost every patient he had attended; that seven had died and many were sick, and that his father and two brothers were that morning given over by the doctors to die.

The young man appeared so anxious, and was so much frightened, that I concluded to go with him. The distance was twenty-eight miles. We started a little before night, and arrived there about ten o'clock.

STATE OF THE PATIENTS.

I found the father and two sons as bad as they could be and be alive; they were stupid and cold. I told the mother that it was very uncertain whether I could help them. She begged me to save her husband's life if possible. I could not tell whether they were dying or whether they were under the influence of opium. I gave them medicine; the two children died in about three hours, but Mr. Folsom soon grew better, and finally got well. I attended eighteen in all, and fifteen of them recovered.

CHARGE OF MURDER, ETC.

Two years after this, the death of these three children was brought against me by the doctors, on the charge of murder. I received for this service fifteen dollars, but no credit given for the fifteen cures out of eighteen cases, when the doctors lost all they were called to attend; and after they had given them over to die, I cured one of them twelve hours afterwards.

After I left the place, the doctor adopted my practice, as far as he knew it, particularly sweating, and about half of his patients lived.

BALANCE OF POWER TO BE OBSERVED.

I was sent for to go to Salisbury, to see a sick child who had been attended by a lady to whom I had given information. The lady complained that the child would not hold sufficient warmth to continue the perspiration. On seeing the child, I at once found out the difficulty. It was this: when they gave medicines to raise the inward heat, and start the determining power to the surface, they at the same time raised the heat on the surface so high as to counteract it.

PRACTICAL APPLICATION OF THEORY.

After explaining the difficulty to them, I raised up the child and poured on it a pint of cold vinegar, and it immediately revived. I applied no more outward heat, only sufficient to shield it from the outward air, and gave the warm medicines inwardly, and on the operation of which, the child grew cold,

and was very much distressed. As soon as the inward heat had gained the ascendency, and drove the cold out or displaced it, the circulation became free, and the child was relieved from pain and fell asleep. The next day the heat was as much higher than what was natural as it was lower the day before; and when the equilibrium of warmth had taken place through the system, establishing the proper balance of power, the child gained its strength, and was soon restored to health.

CONSUMPTION—SALT RHEUM—SUGAR OF LEAD.

In the fall of the year 1808, I was sent for to go to Beverly, to see the wife of a Mr. Appleton, who was the daughter of Elder Williams, the Baptist minister in that town, and was very low of a consumption. She had formerly been afflicted with the salt rheum on her hands, and had applied to a doctor for advice; he had advised her to make use of a sugar of lead wash, which drove the disease to her lungs, and she had been in that situation for a long time, and very little hopes were entertained of her ever being any better. I carried her through a course of the medicine, with very good effect.

I remained in Beverly about a week, and while there became acquainted with Mr. Williams, and also with Mr. William Raymond, to whom I gave information of my practice, and he assisted me to attend on my patients.

I then returned to Portsmouth, where I was constantly called to practice, and had the most desperate cases put under my care, in all of which I met with very great success.

LOVETT'S CASE—INTERESTING.

While practicing in Beverly, I was called on by a Mr. Lovett to attend his son, who was sick, as they supposed with a bad cold —some thought it a typhus fever. I was very much engaged in attending upon the sick at the time, and could not attend, and he came after me three times before I could go. On seeing him, found that he complained of a stiff neck, and appeared to be very stupid, and had no pain. His aunt, who was his nurse, said that he would certainly die, for he had the same symptoms as his mother, who died a short time before. I gave some medicine which relieved him, the next day carried him through a course of medicine, and he appeared to be doing well.

Being called on to go to Salem, I left him in the care of Mr. Raymond, with particular directions to keep in the house and not expose himself. This was on Wednesday, and I heard nothing from him, and knew not but that he was doing well, till the Sunday afternoon following, when I was informed that he was worse. I immediately enquired of Mr. Raymond, and learned from him, that he got so much better that he had been down to the sea side and returned on Friday night; that the weather was

very cold, being in the month of December; that he had been chilled with the cold, and soon after his return had been taken very ill; he staid with him on Saturday night,; that he had not given any medicine, thinking he was too dangerously sick for him to undertake with.

I told the young man's father, that it was very doubtful whether I could do any thing that would help him, but that I would try, and do what I could. I found that the patient was so far gone that the medicine would have no effect, and in two hours told him that I could not help his son, and advised him to call some other help. This was said in the presence of Elder Williams and Mr. Raymond. Mr. Lovett made answer, that if I could not help his son he knew of none who could, and was very desirous for me to stay with him all night, which I did, and stood by his bed the whole time. He was much deranged till morning, when he came to himself and was quite sensible. I again requested the father to send for some other doctor, as I was sensible that I could do nothing for him that would be of any benefit. He immediately sent for two doctors, and as soon as they arrived I left him in their care. They attended him till the next night, about ten o'clock, when he died.

I have been more particular in giving the history of this case, because two years after a charge was brought against me for murdering this young man.

The father and friends expressed no dissatisfaction at the time in regard to my conduct, except they thought I ought not to have neglected the patient so long; but it is a well known fact, that I attended as soon as I knew of his being worse, and that the sole cause of his second attack was owing to his going out and exposing himself, and could not be imputed as any fault of mine.

CONSUMPTION.

In the latter part of December, 1808, I was sent for to attend Elder Bolles, the Baptist minister of Salem. I was introduced to him by Elder Williams, and found him in bed, very weak and low, in the last stage of a consumption—all hopes of a recovery were at an end—his doctors left him as incurable. He asked my opinion of his case; I told him, I could not tell whether there was a possibility of a cure or not till after using the medicine, being doubtful whether there was mortification or not.

I gave his friends as correct an account of his disorder and the operation of the medicine as I could, and said that I did not wish to do any thing which might cause reflections hereafter; but they promised that, let the result be what it might, they should be satisfied, and would not think hard of me.

On these conditions I undertook, and told them that twenty-four hours time would decide whether he lived or died. I began

to give the medicine in the morning, which had a very calm and easy operation. The emetic operated very kindly, and threw off his stomach a large quantity of cold jelly, like the white of an egg; the perspiration moved gently on, and was free; the internal heat produced by the medicine fixed the determining power to the surface, and threw out the putrefaction to such a degree that the smell was very offensive. Mr. Bolles had a brother present, who was a doctor; he said, he did not know whether the medicine made the putrefaction, or whether it made visible what was secreted in the body; but he was soon convinced on that head, for when the medicine had cleansed him, all this putrid smell ceased. While the medicine was in the greatest operation, the perspiration brought out the putrefaction to such a degree, that the nurse in making his bed was so affected with it, that she fainted and fell on the floor.

I attended on him for about three weeks, in which time he was able to set up two or three hours in a day; his food nourished his body, and his strength gained very fast considering the unfavorable season of the year. I gave him my best advice, and left directions how to proceed, and returned home to my family, to spend the rest of the winter with them. I returned in the spring to see Mr. Bolles, and found him so far recovered as to be able to ride out, and in good spirits. He soon gained his health, and is now [1835] well, and ready to give testimony of the facts as I have related them.

ANOTHER SEVERE CASE.

In the season of 1809 I suffered much. In the first part of the summer I attended many patients with old complaints; in particular, one case that I shall mention, of a young woman of Kittery, in a consumption. She had been confined to her house four months; her flesh was exhausted, and she had a violent stricture of the lungs, which she said seemed as though there was a string that drew her lungs to her back. This caused a dry, hacking cough, which was very distressing. I could give her friends no encouragement of a cure; but the young woman and her family were so urgent, that I undertook with her.

Her courage was very great, and she took the medicines and followed all my directions with great perseverance. She said she wished that it might either kill or cure, for she did not desire to live in the situation she was then in. I left her medicine and directions, and occasionally visited her. My plan of treatment was followed with much attention and zeal for six months, before I could raise an inward heat that would hold more than six hours. She then had what was called a settled fever, and I gave her medicine to raise as great an internal heat

as I possibly could; this caused much alarm among her friends, as they thought she would certainly die. I told them that the heat-holding, which was the cause of the fever, was the first favorable symptom that I had seen in her case. She soon gained her health, to the astonishment of all her friends and acquaintances.

She continued to enjoy good health till the next season, when she had another turn of the fever. I attended her in my usual way, and raised the heat till it completely overpowered the cold, when she was entirely cured, and has ever since enjoyed good health. [1822.]

DROPSY—RICKETS.

During this summer, a woman applied to me from a neighboring town, who had the dropsy—and brought with her a little girl who had the rickets very badly, so that she was grown much out of shape. I carried them both through a course of the medicine, attended them for three or four weeks, and then gave the woman information how to relieve herself and the girl, occasionally visiting them. They both recovered of their complaints, and have enjoyed perfect health since.

GRATEFUL RETURNS.

This woman paid me the most liberally of any that I had attended, and has on all occasions manifested her gratitude for the assistance I afforded her.

CANCER.

Another woman from the same town applied to me, who had a cancer on her breast. She had been under the care of several doctors, who had by their course of practice made her worse. I undertook with her, and by giving medicine to check the canker and promote perspiration, effectually relieved her from the disease.

OTHER CASES.

Many other desperate cases, such as consumptions, dropsies, cancers, &c., most of which had been given over by the doctors, were attended by me about this time, which it will be unnecessary for me to particularize; all of them were either completely cured, or essentially relieved and made comfortable, by the system of practice.

DEPLETION, ETC.

A young lady applied to me, who had been much troubled with bleeding at the stomach. She stated to me that she had been bled by the doctors forty-two times in two years, and that they had bled her seven times in six weeks. So much blood had been taken from her, that the blood vessels had contracted

in such a manner that they would hold very little blood; and the heat being thereby so much diminished, the water filled the flesh, and what little blood there was rushed to her face, while the extremeties were cold. This produced a deceptive appearance of health, and caused those who judged by outward appearances to doubt whether there was any disease; so that she had not only to bear her own infirmities, but the reproaches of her acquaintances. I kindled heat enough in the body to throw off the useless water, which gave the blood room to circulate through the whole system, instead of circulating, as it had done before, only in the large blood vessels; and they, being much extended by not having heat sufficient to give it motion, has lead the doctors into the erroneous idea that there was too much blood, and a resort to the practice of bleeding, which reduces the strength of the patient, and increases the disease.

There is no such thing as a person having too much blood, no more than there is of having too much bone, or too much muscle, or sinews; nature contrives all things right. The blood may be too thick so as not to circulate, and is liable to be diseased, like all other parts of the body; but how taking part of it away can benefit the rest, or tend in any way to remove the disease, is what I could never reconcile with common sense.

After I had carried this woman through a full operation of the medicine, and got the heat to hold, so as to produce a natural perspiration, she at once exhibited a true picture of her situation. Instead of appearing to be so fleshy and well as she had done, she fell away and became quite emaciated; but as soon as the digestive powers were restored, so that food could nourish her body, she gained her strength and flesh, and in a short time was completely restored to health.

SPOTTED FEVER.

I was about this time called to attend a woman who was very severely attacked with the spotted fever. The first notice of it was a pain in her heel, which soon moved up to her hips and back, and from thence to her stomach and head, so that in fifteen minutes her sight was gone, and in less than half an hour she was senseless and cold. About this time I saw her, and examined well the cause of the disease. I was well satisfied it was the effect of cold having overpowered the inward heat. By confining her from the air, giving her Nos. 1 and 2, and keeping her in a moderate steam, she in a short time came to her senses, and the symptoms were exactly similar to those of a drowned person coming to, after having life suspended by being under water. As soon as the perspiration became free, all pain ceased, and she was quite comfortable; in twenty-four

hours the disease was completely removed, and she was able to attend to her work.

ANOTHER CASE.

The same day I had another case, of a child which the doctor had given over. When I came to this child it was senseless, and I expected in a mortified state. I gave it the hotteet medicine I could get, with the emetic; it lay about six hours silent, before the medicine had kindled heat enough to cause motion in the stomach and bowels, when it began to revive, and what came from it was black and putrid; the bowels just escaped mortification. The child was soon well.

These two cases were both cured in twenty-four hours time.

REMARK ON SPOTTED FEVER.

When the spotted fever first appeared in Portsmouth, the doctors had five cases, and all of them died. I had five cases, and all of them lived. Because my patients did not die, the doctors said they did not have the fever. In this they had much the advantage of me, for there could be no doubt of theirs all having it, as death was in most of the cases under their care on their side, and decided the question. I have had a great number of cases of the spotted fever under my care, and in all of them used the remains of heat as a friend, by kindling it so as to produce heat enough in the body to overpower and drive out the cold; and have never failed of success, where there was any chance of a cure.

CAPT. TRICKEY'S SICKNESS AND DEATH.

Some time this season I was sent for to attend Capt. Trickey, who was very sick. I examined him and was confident that I could not help him, and took my hat in order to leave the house. His family insisted on my stopping and doing something for him, but I told them that I thought he was in a dying state, and medicine would do him no good. I told his son, that in all probability he would not be alive more than twenty-four hours, and that he had better go for some other help, for I could do him no good. I told the wife that I should give no medicine myself, but as they had some in the house that they knew the nature of, she might if she chose give some of it to her husband, which she did.

Two doctors were sent for; the first one that arrived bled him, and he soon breathed very short, and grew worse: the other doctor came, and said that his breathing short was in consequence of the medicine I had given him; but by this he did not gain credit, for all the family knew to the contrary, and the woman soon after told me of his speech. The patient continued till the next day about ten o'clock, and died.

AGAIN CHARGED WITH MURDER.

As soon as he was dead, the doctors and their friends spared no pains to spread the report in every direction that I had killed him.

SUCCESS AND REMARKS.

The circumstance of the death of Capt. Trickey was seized upon by the doctors and their friends, and the most false and absurd representations made by them through the country, with an intention of stopping my practice, by getting me indicted for murder, or to drive me off; but my friends made out a correct statement of the facts and had it published, which put a stop to their career for that time. I continued my practice, and had a great number of the most desperate cases, in most of which I was successful.

The extraordinary cures I had performed, had the tendency to make many people believe that I could cure every one who had life in them, let their disease be ever so bad; and where I attended on those who were given over as incurable, and they died, whether I gave them any medicine or not, the report was immediately circulated that they were killed by me; at the same time the regular doctors would lose their patients every day, without any notice being taken of it.

REMARKS ON PRACTICE AND CURES.

I could mention a great number of cases of the cures that I performed if I thought it necessary; but my intention is to give the particulars of such only as will have the greatest tendency to convey to the reader the most correct information of my system of practice, without repeating any that were treated in a similar manner to those already given.

I shall now proceed to give the particulars of one of the most important circumstances of my life, in as correct and impartial a manner as I am capable of doing from memory.

INDICTMENT FOR MURDER.

After practicing in those parts through the season of 1809, I went home to Surry, where I remained a few weeks, and returned to Salisbury. On my way there I made several stops in different places where I had before practiced, to see my friends and to give information to those who made use of my medicine and practice. On my arrival at Salisbury, my friends informed me that Dr. French had been very busily employed in my absence, and that he and a deacon Pecker, who was one of the grand jury, had been to Salem, to the court, and on their return had said that there had been a bill of indictment found against me for wilful murder. They advised me to go off, and keep out of the way; but I told them that I should never do

that, for if they had found a bill against me, the government must prove the charges, or I must be honorably acquitted.

About ten o'clock at night, Dr. French came to the place where I stopped, with a constable, and made me a prisoner in behalf of the commonwealth. I asked the constable to read the warrant, which he did. By this I found that Dr. French was the only complainant, and the justice who granted the warrant ordered me before him to be examined the next morning.

FRENCH'S ABUSE.

While at the house, and a prisoner, Dr. French took the opportunity to abuse and insult me in the most shameful manner, without any provocation on my part. He continued his abuse to me till between two and three o'clock, when he took his horse and went to Salem to get the indictment.

After he was gone, I found on inquiry of the constable, that after he had been before the grand jury and caused me to be indicted, he came home before the bill was made out, and finding that I was at Salisbury, fearing that I might be gone, and he should miss the chance of gratifying his malicious revenge against me, he went to a brother doctor, who was a justice of the peace, before whom he made oath, that he had probable cause to suspect, and did suspect, that I had with malice aforethought murdered sundry persons in the course of the year past, whose names were unknown to the complainant; upon which a warrant was issued against me, and I was arrested as before stated, in order to detain and keep me in custody till the indictment could be obtained.

ADVISED TO ESCAPE, ETC.

In the morning I was brought before the said justice, and he not being ready to proceed in my examination, the court was adjourned till one o'clock, when I was again brought before him, and he said he could not try me till the complainant was present, and adjourned the court again until near night. The constable took me to his house in the mean time, and put me in a back room and left me alone, all of them leaving the house. When they came back, some of them asked me why I did not make my escape, which I might easily have done out of a back window; but I told them that I stood in no fear of the consequence, having done nothing whereby I ought to be punished; that I was taken up as a malefactor, and was determined to be convicted as such, or honorably acquitted. Just before night, Dr. French arrived with a sheriff, and ordered me to be delivered up by the constable to the sheriff; and after Dr. French had again vented his spleen upon me by the most savage abuse that language could express, saying that I was a murderer, and

and that I had murdered fifty, and he could prove it; that I should be either hung or sent to the state prison for life.

CONFINED IN A DUNGEON WITH A FELON, ETC.

I was then put in irons by the sheriff, and conveyed to the jail in Newburyport, and confined in a dungeon, with a man who had been convicted of an assault on a girl six years of age, and sentenced to solitary confinement for one year. He seemed to be glad of company, and reminded me of the old saying, that misery loves company. I was not allowed a chair or a table, and nothing but a miserable straw bunk on the floor, with one poor blanket which had never been washed. I was put into this prison on the 10th day of November, 1809; the weather was very cold, and no fire, and not even the light of the sun or a candle; and to complete the whole, the filth ran from the upper rooms into our cell, and was so offensive that I was almost stifled with the smell. I tried to rest myself as well as I could, but got no sleep that night, for I felt something crawling over me, which caused an itching, and not knowing what the cause was, inquired of my fellow sufferer; he said that it was the lice, and that there were enough of them to shingle a meeting-house.

PRISON DIET, ETC.

In the morning there was just light enough came through the iron grates to show the horror of my situation. My spirits and the justice of my cause prevented me from making any lamentation, and I bore my sufferings without complaint. At breakfast time I was called on through the grates to take our miserable breakfast. It consisted of an old tin pot of musty coffee, without sweetning or milk, and was so bad as to be unwholesome; with a tin pan containing a hard piece of Indian bread, and the nape of a fish, which was so hard I could not eat it. This had to serve us till three o'clock in the afternoon, when we had about an equal fare, which was all we had till the next morning.

RELIEVED BY A FRIEND.

The next day Mr. Osgood came from Salisbury to see me, and on witnessing my miserable situation, he was so much affected that he could hardly speak. He brought me some provisions, which I was glad to receive; and when I described to him my miserable lodgings, and the place I was in, he wept like a child. He asked liberty of the jailer to furnish me with a bed, which was granted, and he brought me one, and other things to make me comfortable. The next day I wrote letters to my family, to Dr. Fuller, and to Judge Rice, stating to them my situation.

BED, ETC. SHARED WITH FELLOW-PRISONER.

The bed which was brought to me I put on the old one, and allowed my fellow-sufferer a part of it, for which he was very thankful. I had provisions enough brought me by my friends for us both, and I gave him what I did not want; the crusts and scraps that were left his poor wife would come and beg and carry to her starving children, who were dependent on her. Her situation and that of her husband were so much worse than mine, that it made me feel more reconciled to my fate; and I gave her all I could spare, besides making his condition much more comfortable, for which they expressed a great deal of gratitude.

CONSULTATION, CONCLUSION, ETC.

In a few days after my confinement, Judge Rice came to see me, and brought a lawyer with him. On consulting upon the case, they advised me to petition the Judges of the Supreme Court to hold a special court to try my cause, as there would be no court held by law, at which it could be tried, till the next fall, and as there could be no bail for an indictment for murder, I should have to lay in prison nearly a year, whether there was any thing against me or not.

POLICY OF ENEMIES.

This was the policy of my enemies, thinking that they could keep me in prison a year, or in all probability I should not live that time, and their ends would be fully answered.

TIME FOR TRIAL.

I sent on a petition, agreeable to the advice of my friends, and Judge Rice undertook to attend to it and to do every thing to get the prayer of the petition granted. He followed the business up with great zeal, and did every thing that could be done to effect the object. I think he told me that he or the lawyer, Mr. Bartlett, had rode from Newburyport to Boston fifteen times in the course of three weeks, on the business. At length Judge Parsons agreed to hold a special court at Salem, on the 10th day of December, to try the cause, which was one month from the day I was committed. My friends were very attentive and zealous in my cause, and every preparation was made for the trial.

COLD WEATHER—BAD AIR—FRIENDS DEPART, ETC.

During this time the weather was very cold, and I suffered greatly from that cause, and likewise from the badness of the air in our miserable cell, so that I had not much life or ambition. Many of my friends came to see me, and some were permitted to come into the cell; but the air was so bad and the

smell so offensive that they could not stay long. My friend Dr. Shephard came to see me, and was admitted into our dungeon. He staid a short time, but said it was so offensive that he must leave me; that he would not stay in the place a week for all Newburyport. On thanksgiving day we were taken out of our cell and put in a room in the upper story, with the other prisoners, and took supper together; they consisted of murderers, robbers, thieves, and poor debtors. All of us tried to enjoy our supper, and be in as good spirits as our condition would permit. The most of their complaints were of the filthiness and bad condition of the prison, in which we all agreed. Before it was dark my companion and I were waited upon to our filthy den again.

There was nothing in the room to sit upon higher than the thickness of our bed, and when I wrote any thing I had to lay on my belly, in which situation I wrote the Medical Circular, and several other pieces, which were afterwards printed.

VISIT FROM SON-IN-LAW.

After I had been in prison about two weeks, my son-in-law came to see me. I had before sent for him to come to Portsmouth on some business, and on hearing of my being in prison he immediately came to Newburyport to see me. He seemed to be much more troubled about my situation than I was myself.

CONSCIOUS INNOCENCE.

I felt perfectly conscious of my innocence, and was satisfied that I had done nothing to merit such treatment; therefore my mind was free from reproach; for I had pursued the course of duty, which I conceived was allotted to me by my Maker, and done every thing in my power to benefit my fellow creatures. These reflections supported me in my troubles and persecutions, and I was perfectly resigned to my fate.

INDICTMENT READ, ETC.

About this time, a lawyer came into the prison and read to me the indictment, which was in the common form, that I with malice aforethought, not having the fear of God before my eyes, but moved by the instigation of the devil, did kill and murder the said Lovett, with lobelia, a deadly poison, &c.; but feeling so perfectly innocent of the charges which the bill alleged against me, it had very little effect upon my feelings; knowing them to be false, and that they had been brought against me by my enemies, without any provocation on my part.

REMOVED FROM CELL—EFFECT OF FIRE UPON HIM.

On the morning of the day that was appointed for me to be removed to Salem for trial, I was taken out of my loathsome cell by the jailor, who gave me water to wash myself with, and I was permitted to take my breakfast by a fire, which was the first time I had seen any for thirty days, and could not bear to sit near it, in consequence of its causing me to feel faint. As soon as I had eaten my breakfast, the iron shackles were brought and put on my hands, which I was obliged to wear till I got to Salem. The weather was very cold, and the going bad, but we stopped but once on the way, the distance being about twenty-six miles. On our arrival, I was delivered over to the care of the keeper of the prison in Salem, and was confined in a room in the second story, which was more comfortable than the one I had left.

TRIAL PUT OFF.

I was soon informed that Judge Parsons was sick, and had put off my trial for ten days; so I had to reconcile myself to the idea of being confined ten days more without fire. However I was not without friends; Elder Bolles and Capt. Russell came to see me the first night, and Mrs. Russell sent her servant twice every day, with warm coffee and other things for my comfort, for which I have always been grateful; and Mrs. Perkins, whom I had cured of a dropsy, sent for my clothes to wash against the day of trial.

ATTENTION OF FRIENDS—PREPARATION FOR TRIAL.

Many of my friends came to Salem to attend my trial; some as witnesses, and others to afford me any assistance in their power. A few days before my trial, Judge Rice and Mr. Bartlett, whom I had employed as my lawyer, held a consultation with me as to the arrangements necessary to be made, when it was decided that it would be best to have other counsel, and Mr. Story was agreed upon, and engaged in my cause. I had also engaged Mr. Bannister, of Newburyport, to assist in the trial; but he was of no benefit to me, and afterwards sued me for fifty dollars, at fifty miles distance, to put me to great expense.

In order to be prepared for the trial, my counsel held a consultation together, and examined the principal witnesses in the defence. Mr. Bolles, Judge Rice, and several others, gave great satisfaction as to the value and usefulness of the medicine, and the variety of cures that had been performed with it within their knowledge. Dr. Fuller, of Milford, N. H., was present, and made many statements in my favor, as to the value of my medicine, and advised to have Dr. Cutler, of Hamilton, summoned, which was done. Every thing was done by

my friends that was in their power, to assist me and give me a chance for a fair trial, for which I shall always feel very grateful.

ARRAIGNED, PLEADS NOT GUILTY.

On the 20th of December, 1809, the Supreme Court convened for my trial, at which Judge Parsons presided, with judges Sewall and Parker assistant judges. The case was called about ten o'clock in the morning, and the chief justice ordered me to be brought from the prison and arraigned for trial. I was attended by two constables, one on my right and the other on my left, in which situation I was brought from the jail to the court house, and placed in the bar. The court house was so crowded with the people that it was with much difficulty we could get in.

After I was placed in the criminal seat, a chair was handed me, and I sat down to wait for further orders. Here I was the object for this great concourse of people to look at—some with pity, others with scorn. In a few minutes I was directed to rise and hold up my right hand, to hear the indictment read, which the grand jury had upon their oaths presented against me. I was then directed by the court to plead to the indictment, guilty, or not guilty; I plead not guilty, and the usual forms in such cases were passed through, the jury called and sworn, and the trial commenced.

TESTIMONY OF LOVETT.

The solicitor general arose, and opened the case on the part of the commonwealth, and made many hard statements against me, which he said he was about to prove. He stated that I had at sundry times killed my patients with the same poison. The first witness called on the stand on the part of the government was Mr. Lovett, the father of the young man that I was accused of killing. He made a tolerable fair statement of the affair in general, particularly of coming after me several times before I could attend, though I think he exaggerated many things against me; and I also thought that he omitted to tell many things in my favor that must have been within his knowledge; but there was nothing in his evidence that in the least criminated me, or supported the charges in the indictment.

DR. HOWE SWORN—LOBELIA—COURT SURPRISED.

The next witness was Dr. Howe—called to prove that I had administered the poison alleged in the indictment. He stated that I gave the poison to the said Lovett, and produced a sample of it, which he said was the root of lobelia. The judge asked him if he was positive that it was lobelia; he said it was, and that I called it coffee. The sample was handed round for the

court to examine, and they all appeared to be afraid of it: and after they had all satisfied their curiosity Judge Rice took it in his hand and ate it, which very much surprised them. The solicitor general asked him if he meant to poison himself in the presence of the court; he said it would not hurt him to eat a peck of it, which seemed to strike the court with astonishment.

CROSS EXAMINED.

Dr. Howe was then called at my request for cross examination, and Mr. Story asked him to describe lobelia, how it looked when growing, as he had sworn to it by the taste and smell. This seemed to put him to a stand; and after being silent for several minutes, he said he had not seen any so long he should not know it if he should see it at this time. This so completely contradicted and did away all that he had before stated, that he went off the stand quite cast down.

DR. CUTLER'S TESTIMONY.

Dr. Cutler was called on to inform the court what the medicine was, that Dr. Howe had so positively declared to be lobelia, and after examining it, he said it appeared to him to be marsh rosemary—which was the fact. So far, all they had proved against me was, that I had given the young man some marsh rosemary—which Dr. Cutler had declared to be a good medicine.

FALSE SWEARING.

Some young women were brought forward as witnesses, whom I had no knowledge of ever seeing before. One of them said that I crowded my puke down Lovett's throat, and he cried murder till he died. This was well known to be a falsehood, and that the story was wholly made up by my enemies, as well as what had been before stated by those women, for the purpose of trying to make out something against me. I had two unimpeachable witnesses in court, ready to swear that I never saw the young man for more than fourteen hours before he died, during all which time he was in the care of Dr. Howe; but by not having an opportunity to make my defence, in consequence of the government not making out their case against me, could not bring them forward.

A GOOD WITNESS.

John Lemon was the next witness brought forward by the commonwealth, and was directed to state what he knew about the prisoner at the bar. He stated, that he had been out of health for two years, being much troubled with a pain in his breast; that he could get no help from the doctors; that he ap-

plied to me and I had cured him in one week; and that was all he knew about the prisoner at the bar.

COURT IMPATIENT.

By this time, Judge Parsons appeared to be out of patience, and said he wondered what they had for a grand jury, to find a bill on such evidence. The solicitor general said he had more evidence which he wished to bring forward.

DR. FRENCH SWORN.

Dr. French was called, and as he had been the most busy actor in the whole business of getting me indicted, and had been the principal cause, by his own evidence, as I was informed, of the grand jury finding a bill against me, it was expected that his testimony now would be sufficient to condemn me at once; but it turned out, like the rest, to amount to nothing. He was asked if he knew tbe prisoner at the bar; he said he did. He was then directed to state what he knew about him. He said, the prisoner had practiced in the part of the country where he lived, with good success, and his medicine was harmless, being gathered by children for the use of the families.

PROSECUTION FAILS.

The judge was about to charge the jury, when the solicitor general arose, and said, that if it was not proved to be murder, it might be found manslaughter. The judge said, you have proved nothing against the man, and repeated, that he wondered what they had for a grand jury.

CHARGE TO JURY.

In his charge to the jury, the judge stated that the prisoner had broken no law, common or statute, and quoted Hale, who says, any person may administer medicine, with an intention to do good; and if it has the contrary effect from his expectation, and kills the patient, it is not murder, nor even manslaughter. If doctors must risk the lives of their patients, who would practice? He quoted also from Blackstone, who says, where no malice is, no action lies.

ACQUITTAL.

The charge being given to the jury, they retired about five minutes, and returned into court, and gave in their verdict of *not guilty*.

REMARKS.

I was thus honorably acquitted, without having had an opportunity to have my witnesses examined, by whom I expected to have proved the usefulness and importance of my discovery

before a large assembly of people, by the testimony of about twenty-five creditable men, who were present at the trial, besides contradicting all the evidence produced against me. After the trial was over, I was invited to the Sun Tavern to supper, where we enjoyed ourselves for the evening. When we sat down to the table several doctors were present, who were so offended at my acquittal that they left the table.

ATTENTIONS OF FRIENDS—IMPAIRED HEALTH, ETC.

The next day I went to Salisbury, and stopped with Mr. Osgood, where I was first arrested. Mrs. Osgood and a young woman who had been employed by me as a nurse, assisted to clean my clothes and clear me of some troublesome companions I had brought with me from the prison, and when I had paid a visit to all my old friends, who were very glad to see me, I went to Portsmouth, to recover my health, which was very much impaired by being confined forty days in those filthy and cold prisons, in the coldest part of a remarkably cold winter. My friends attended upon me, and carried me through a regular course of medicine; but the first operation of it had but little effect, in consequence of my blood being so much chilled, and it was a long time before I could raise a perspiration that would hold.

OBJECT OF THE DOCTORS.

I am confident that I should not have lived through the winter in prison, and believe that this was their plan, for which purpose they had me indicted for murder, knowing that in that case there could be no bail taken, and that as there would be no court at which I could be tried for nearly a year, I should have to lay in prison during that time, and that I should probably die there; or in any case, they would get rid of me for one year at least, whether there was any thing proved against me or not; and in that time the doctors and their dupes would be enabled to run down the credit of my medicine, and put my practice into disrepute among the people. But I have been enbled, by good fortune and the kind assistance of my friends, to defeat all their plans.

JUDGMENTS.

Most of those who have been instrumental in trying to destroy me and my practice, have had some judgment befall them, as a reward for their persecutions and malicious conduct towards me. I was credibly informed that Deacon Pecker, one of the grand jury that found the bill against me, went with Dr. French to hunt up evidence to come before himself, in order to have me indicted. A short time after I was put in prison, he

had a stroke of the palsy, and has remained ever sinee [1822,] with one half of his body and limbs useless. Dr. French, one year after I was acquitted, was brought to the same bar at which I was placed, and convicted for robbing a grave yard of a dead body, which it was reported he sold for sixty dollars. He lost all his credit, and was obliged to quit his country.

CALLED TO EASTPORT.

About the first of June, 1811, I received a letter from Eastport, Me., where I had been the fall before, and shown some of my mode of practice. Some of the people in that place were so well satisfied with it, that seven men had subscribed their names to the letter, requesting me to come there and practice in the fevers which prevailed in those parts.

I left the care of my business at Portsmouth with Mr. Carpenter, my student, and immediately took passage for Eastport, where I arrived about the middle of June. I was very gladly received by those who wrote to me, and by those with whom I had become acquainted when there before. I agreed to practice under the protection of those who had sent for me, until I had convinced them of its utility, to which they consented, and promised me all the assistance in their power. I was soon called on to practice, and had all the most desperate cases that could be found, in all of which I met with very great success.

FIRST CASES, CONSUMPTION.

The first cases I attended in presence of the committee were five desperate cases of consumption. These patients were all relieved in three weeks, and were all living this present year, (1831).

BRUISED FOOT.

While attending these people, I was called upon to attend a young man on board a vessel, who had his foot bruised to pieces by a block falling from the mast head. It being done five days before I saw him, it was mortified, and the whole body in convulsions. I took off three toes and set the fourth, and cured him in five weeks with the usual practice.

ATTEMPT TO MURDER, AND CONSEQUENCES.

While attending him, I had to pass a doctor's shop. A scythe was thrown at me, point first, about two rods. It passed between my feet, without doing any injury. In consequence of this assault, I sent word to all the doctors who had opposed me, that for the politeness with which they had treated me, I would compensate them by taking off the burden of being called up at night, and thus breaking their rest, and would give

them a chance of laying in bed until noon, without being disturbed by their patients.

CONFINEMENT.

I was called on, the night following, to attend a woman in child-bed. I attended according to my promise, and let them rest; and if I had remained there, they might have rested until the present time, as I attended to all branches in practice.

NUMBER OF DOCTORS, ETC.

There were, I think, five practicing doctors on the island, among whom my success in curing the sick caused great alarm, and I soon experienced the same determined opposition from them, with all the arts and plans to destroy me and my practice, that I had experienced from the same class of men in other places.

I shall relate the particulars of some of the cases I attended; but most of the numerous cases which I had under my care were so nearly similar to those that have been already given, and my mode of treating them being about the same, that it will be unneeessary to repeat them.

A CASE OF DROPSY.

I was sent for to visit a Mrs. Lovett, who was the daughter of Mr. Delisdernier, at whose house I attended her. She had the dropsy, and had been under the care of one of the doctors, till he had given her over as incurable. I went to see her, in company with the doctor, but we could not agree as to the cause and remedy.

OPINIONS OF THE DOCTOR.

I asked him several questions concerning the power of the elements, and the effect of heat on the human system. He answered, that the elements had nothing to do with the case. After giving him my ideas on the subject, which all appeared to be new to him, I told him that the contest in this case was between the fire and water, and if I could get heat enough in the body to make the water volatile, it could not stay there. He said that any thing warm would not answer for her. I then asked him how he thought the hottest medicine would do; he said it would produce immediate death. I then told him, that if I did any thing for her, I should administer the hottest medicine I could give.

UNWILLING TO ATTEND THE PATIENT.

Finding there would be a disadvantage on my part in doing any thing for her, as the doctor and I could not agree, I left the

house. I was followed by the father and mother and the doctor, who all insisted on my returning, but I told them that notwithstanding the doctor had given her over, if I was to attend her and she should die they would say that I killed her.

OVERPERSUADED TO ATTEND.

They promised, that let the consequences be what they might no blame should be alleged against me; upon which I agreed that I would stop, on condition that two of my friends should be present as witnesses to what was said, and see the first process of the medicine, which was assented to, and they were sent for and heard the statement of the doctor and family.

ANOTHER WITNESS.

A Capt. Mitchell, from New York, was also present and heard the conversation between me and the doctor, and was pleased with the principles that I laid down so much that he expressed a wish to be present and see the operation of the medicine, and staid accordingly.

MANAGEMENT OF DOCTOR, NURSE, ETC.

The doctor pretended to be going away till after I had given the first medicine, and appeared to be very busy going out and coming in, and had much conversation with Mrs. Lovett, the husband's mother, who was the nurse. After the first medicine had done, which operated favorably, I gave directions what to do, and particularly to keep the patient in a perspiration during the night, and left medicine for that purpose. We then went home.

ORDERS DISOBEYED—PATIENT WORSE.

In the morning I called to see her, and to my surprise found her sitting with the window up, and exposed to the air as much as possible. On examination, I found that no medicine had been used. On enquiry, I found that the doctor had been in frequently to see her; and on enquiry why they had not followed my directions, the nurse appeared to be very cross, and said she would not take any of my medicine. I told them that they had not killed her, but I did not thank them for their good will any more than if they had done it.

LEAVES—AND PERSUADED TO RETURN.

I was about leaving the house, as I found my directions would not be attended to by the nurse, but Capt. Mitchell was very urgent for me to continue. I told him that if he would attend upon her and see the medicine given and every thing done according to my directions, I would continue, to which he agreed. I left the patient in his care, and he attended her

faithfully through the day; at night I visited her, and found the swelling began to abate. He continued his care of her, and in three days she was able to go up and down stairs, and in one week she was well. By the influence of the doctor, the woman and the husband all turned against me, and I never received any thing for my trouble, but their abuse and slander. The woman's father and Capt. Mitchell however, gave me all credit for the cure, and they both purchased a right.

INFAMOUS CONFESSION OF THE NURSE.

About a year after, at a private assembly of women, this Mrs. Lovett, the mother-in-law of the sick woman, gave an account of the whole transaction, and stated that there was a private interview between her and the doctor, and it was agreed to go contrary to my directions, and the doctor said she would die in the course of the night; and that he should take me up for murder, and that she must be an evidence. This appeared to be almost incredible, that they should be so void of all human feelings, as to be willing to have the woman die, in order to have the opportunity to take me up for murder; but two women who were present when she told the story, gave their depositions proving the fact as above stated.

PRACTICE—SOCIETY FORMED—LECTURES.

I continued my practice on the Island, at Lubec, and on the main, paying my most particular attention to those who sent for me, and wanted information. I practised under their inspection about five weeks, and then told them that I had done enough for a trial, to prove the use of the medicine, and shonld do no more till I knew whether a Society could be formed. They expressed their entire satisfaction, and wished to have a Society formed; a meeting was called for that purpose, and sixteen signed the articles at the first meeting. After this a meeting was held every week, at which a Lecture was given for the purpose of giving information, and for the admission of members; and eight each week were added during the summer.

RETURN TO PORTSMOUTH.

In the fall I went back to Portsmouth to attend to my business there, and see to the Society which had been formed in that place.

RETURN TO EASTPORT WITH STUDENT.

After staying in Portsmouth a few weeks to give information to the people, and procuring a stock of medicine, I made arrangements to return to Eastport; and some time in the month of October, I set sail for that place, taking with me my student and Stephen Sewell. On my arrival I introduced Mr. Car-

penter as my student. I took a small shop, and put into it a good assortment of medicine, and attended to practice till I had got Mr. Carpenter introduced among the people.

MRS. LOVETT, HER MYSTERIOUS ACTIONS, ETC.

While practising here, I frequently heard of the abuse and scandal towards me and my practice, from Mrs. Lovett, the old woman before mentioned, as the nurse of her son's wife, whom I cured of the dropsy. This old lady was a singular character, and was called a witch by the people; I have no faith in these kind of things, yet her conduct and certain circumstances that took place, were very extraordinary, and puzzled and astonished me more than any thing I had ever met with, and which I have never been able to account for to this day. Mr. Carpenter was attending a man, where this woman often visited, who had the consumption, and his child, which was sick and had fits. He came to me and said that the medicine he gave would not have its usual effect; that the emetic, instead of causing them to vomit, would make them choke and almost strangle.

UNACCOUNTABLE MYSTERIES OF PATIENTS.

I attended them myself, and on giving the medicine, it would operate on the man, and not on the child at one time, and the next time on the child and not on him. Sometimes the child would lay in fits for the whole night, and nothing would have any effect upon it; in the morning it would come out of them and appear to be quite bright and lively. I had never known the medicine to fail of producing some effect before, where the patient was not so far gone as not to have life enough left to build upon. I can give no reason for this strange circumstance, satisfactory to myself, or which would be thought reasonable by the reader. The old woman, before mentioned, was frequently in and out of the house where the man and child were, and seemed to be very much interested about them; when she was gone the child would frequently go into violent fits, and when I steamed it, it was said the old woman would be in great distress.

WITCHCRAFT.

It caused much conversation among the neighbors; they believed it to be the power of witchcraft; and that the old woman had a control over the destinies of the man and child, and was determined to destroy them in order to get her revenge on me. I have no belief in these things; but must confess that her strange conduct, and the extraordinary circumstances attending the whole affair, baffled me more than any thing I had

ever met with before. I was unable to do any thing for these two patients, except sometimes by a temporary relief. They continued to grow worse, and finding it not in my power to do them any good, I left them, and they both soon after died.

REMARKS.

Whether the extraordinary circumstances attending the two cases above stated, were caused by a stratagem of the doctors, in which the old woman was made their agent, to injure me by causing in some way or other poisonous medicines to be administered to them in order to prevent my medicine from having any salutary effect, is what I do not feel disposed to assert as a fact; but the many cases in which I have been certain that such things have been done by the faculty, and their enmity and uniform opposition to my practice, both at this place and elsewhere, as well as the confession made by the old woman, would tend strongly to confirm such a belief. I could mention a great number of facts in addition to what I have said in regard to this affair, if necessary, which appeared very extraordinary to me and all who witnessed them; but I think that enough has been said on the subject, and shall leave it to the public to decide between us.

DOCTORS OUT OF BUSINESS.

There were five doctors at Eastport when I went there, who had a plenty of business; but my success was so great, and the people became so well satisfied of the superiority of my system of practice over theirs, that they were soon relieved from most of their labors; and in a short time after, three of them had to leave the place for want of employment.

PATIENTS—RETURNS TO PORTSMOUTH.

After arranging my business, I concluded to return to Portsmouth; a short time before I came away, a Mr. Whitney came to me for assistance, and purchased a right. About the same time a Mr. McFadden applied also for assistance, who had the consumption. I left them both under the care of Mr. Carpenter, and immediately sailed for Portsmouth, where I arrived in safety.

DECLARATION OF WAR.

Soon after my arrival there I found there was going to be a war with Great Britain; in consequence of which I returned immediately back to Eastport to settle my affairs in that place. In a short time after my arrival there, the declaration of war came on, and I made the best arrangements of my business I could, leaving Mr. Carpenter with directions if there should any thing happen in consequence of the war, so as to be necessary

for him to leave the Island, to come to Portsmouth. Before leaving the place, I called on him for some money, and all he could pay me was sixty-four dollars, which was but one dollar more than I had paid for his board and shop rent. The people were in such confusion it was impossible to get a settlement with any one. I left Mr. Whitney and Mr. McFadden in his care, and left the Island about the middle of June, and arrived in Portsmouth in forty-eight hours, where I remained the greater part of the summer; during which time I had constant practice, and formed some regulations for the society, which was established there, for the purpose of greater facility in communicating information of my system of practice to the people who wished my assistance.

PUBLISHES HIS BOOK OF DIRECTIONS.

In the fall of this year I published my pamphlet of directions, as many were urgent that I should not leave the place destitute of the knowledge of my practice and medicine. Many persons who had been the most urgent for me to give them information, now became the most backward and complained that the restrictions were too hard with regard to their giving the information to others; some of whom had never done the least thing to support the practice or me.

INGRATITUDE FOR BENEFITS CONFERRED.

When any of them were sick they were ready enough to call on me for assistance; and if I relieved them quick they thought it worth nothing, and they run out against my practice, saying I deserved no pay. This sort of treatment I have met with from a certain class of people in all places where I have practised. I was treated with much attention when they were in danger from sickness; but when I had cured them I was thought no more of. This kind of ingratitude I have experienced a pretty good share of during my practice.

ENEMIES AND FRIENDS.

I found I had enemies on every hand, and was in danger of falling by some one of them. Every thing seemed to conspire against me; but I had some friends who have never forsaken me; my courage remained good, and my spirits were never depressed; and it appeared to me that the more troubles I had to encounter, the more firmly I was fixed in my determination to persevere unto the last.

DELIBERATIONS—OBTAINS A PATENT.

When I had maturely considered the subject in all its bearings, and exercised my best abilities in devising some plan by which I could extricate myself from the dangers which threat-

ened me on every hand; and to prevent those rights which twenty year's labor, with much suffering and great expense had given me a just claim to, from being wrested from me; I finally came to the conclusion that there was only one plan for me to pursue with any chance of success; and that was to go on to Washington, and obtain a patent for my discoveries; and put myself and medicine under the protection of the laws of my country, which would not only secure to me the exclusive right to my system and medicine, but would put me above the reach of the laws of any state.

STARTS FOR WASHINGTON.

After coming to the conclusion to go on to the seat of Government and apply for a patent, made all necessary preparation for the journey, and started from Portsmouth on the 7th of February, and arrived at Washington on the 23d.

CONSULTATION.

The next day after my arrival, I waited on Capt. Nicholas Gilman, of Exeter, showed him my credentials, and asked his advise, what I must do to obtain my object. He said he thought it could not be made explicit enough to combine the system and practice, without being too long; he however advised me to carry my petition to the patent office; which was then under the control of Mr. Monroe, Secretary of State. I went to the patent office, and found that Dr. Thornton was the clerk, and presented him my petition. He asked me many questions, and then said I must call again; I called again the next day and he said the petition was not right; that I must specify the medicine, and what disorder it must be used in; he said that those medicines in general terms to cure every thing, was quackery; that I must particularly designate the medicine, and state how it must be used, and in what disease.

VISITS GOV. CHITTENDEN.

I then waited on Martin Chittenden, late Governor of Vermont, who was at Washington, and asked his assistance; he was from the same town where my father lived, and readily consented. We made out the specification in as correct a manner as we could, and the next day I carried them to the patent office, and gave them to Dr. Thornton.

OBSTACLES AT THE PATENT OFFICE.

He complained much about its being too short a system, and put me off once more. I applied again and asked him for my patent; but he said I had not got the botanic names for the articles, and referred me to Dr. Mitchell of New York, who was in the House of Representatives. I applied to him and re-

quested him to give the botanic names to the articles mentioned in my petition. He wrote them, and I carried them to Dr. Thornton; but he was unable to read some of the names, one in particular; he said I must go again to Dr. Mitchell, and get him to give it in some other words, and not tell him that he could not read it. I went, and the doctor wrote the same word again, and then wrote, "or Snap-dragon;" which I carried to Dr. Thornton, and requested him to put in the patent my names, and recorded it for himself, snap-dragon, or any other name he chose. He then talked about sending me to Philadelphia, to Dr. Barton, to get his names.

I found he was determined to give me all the trouble he could, and if possible to defeat my getting a patent, and I intimated that I should go with my complaint to Mr. Monroe, upon which he seemed a little more disposed to grant my request, and said he would do without Dr. Barton's names.

PATENT MADE OUT.

He then went to work to make out the patent, and when he came to the article of myrrh, he found much fault about that and said it was good for nothing. I told him that I paid for the patent, and if it was good for nothing it was my loss. After much trouble I got it made out according to my request, and the medicine to be used in fevers, colics, dysenteries, and rheumatisms; he then asked me if I wanted any additions, and I told him to add, "the three first numbers may be used in any other case to promote perspiration, or as an emetic," which he did. I then had to go to the treasury office and pay my money and bring him duplicate receipts. After all this trouble, I at length succeeded in obtaining my patent according to my request, which was completed and delivered to me on the third day of March, 1813.

INTERVIEW WITH DRS. RUSH AND BARTON.

I then took passage in the stage and came on to Philadelphia, where I remained several days, for the purpose of seeing doctors Rush and Barton, to confer with them on the subject of introducing my system of practice to the world. I spent considerable time with Dr. Barton, but Dr. Rush was so much engaged that I was able to have but little conversation more than stating my business. He treated me with much politeness, and said that whatever Dr. Barton agreed to he would give his consent, so that my business was chiefly with the latter gentleman. I asked him many questions concerning my system and patent, and requested his advice of the best mode of introducing it. He advised me to make friends of some celebrated doctors, and let them try the medicine, and give the public such recommendation of it as they should deem correct. I told him I feared that

if I should do so they would take the discovery to themselves, and deprive me of all credit or benefit from my labors, and asked him whether he thought that would not be the case. He said it might with some, but he thought there were some of the profession honorable enough not to do it. I asked him if he would make a trial of it himself, and give it such credit as he should find it to deserve. He said, that if I would trust it in his hands he should be pleased, and would do justice to me and the cause. I accordingly left some of the medicine with him with directions how to use it; but before I received any return from him he and Dr. Rush also died some time previous, by which means I was deprived of the influence of these two men, which I was confident would otherwise have been exerted in my favor.

DR. BARTON'S ADMISSION.

During my interviews with Dr. Barton, we had much conversation upon the subject of the medical skill, and he being quite sociable and pleasant, I expressed myself very freely upon the fashionable mode of practice used by the physicians of the present day. He acknowledged there was no art or science so uncultivated as that of medicine. I stated to him pretty fully my opinion of bleeding to cure disease, and pointed out its inconsistency, inasmuch as the same method was made use of to cure a sick man as to kill a well beast. He laughed, and said it was strange logic enough.

DR. RUSH—TREATMENT OF YELLOW FEVER, ETC.

While I was in the city of Philadelphia I examined into their mode of treating the yellow fever, and found, to my astonishment, that the treatment prescribed by Dr. Rush was to bleed twice a day for ten days. It appeared to me very extroardinary, to bleed twenty times to cure the most fatal disease ever known; and I am confident that the same treatment would kill one half of those in health. This absurd practice being followed by the more ignorant class of the faculty, merely because it has been recommended in some particular cases by a great man, has, I have not the least doubt, destroyed more lives than have ever been destroyed by powder and ball in this country in the same time. Those I met in the streets who had escaped the pernicious effect of bleeding, mercury, and other poisons, carried death in their countenance; and on conversing with them they said they had never been well since they had the fever; that they took so much mercury and opium they were afraid they were in a decline.

RETURN TO PORTSMOUTH.

After remaining in Philadelphia about two weeks, I went in the stage to New-York, where I obtained a passage in a coast-

er, and arrived at Portsmouth on the fifth day of April. Immediately after my arrival at Portsmouth, I gave notice in the newspapers of having obtained a patent, and forbid all persons trespassing upon it, under the penalty of the law in such cases provided.

PRACTICE IN PORTLAND.

After going and settling my business in Eastport, I returned again to Portsmouth, where I stopped but a short time, and taking Mr. Sewell with me, went to Portland, to introduce my practice. On our arrival, I advertised my patent in the newspapers, and had handbills printed and circulated among the people, giving the conditions on which I should practice, and the manner of selling family rights to those who wished the use of my practice and medicine, and that I should attend in no case except such as wished to purchase the rights, to give them information, and prove the utility of the medicine. I gave the information to Mr. Frickett, where we boarded, and a right of using the medicine for himself and family, and gave information to several of his workmen. Soon after making myself known, I had a great number of desperate cases put under my charge, all of which were cured or essentially relieved. My success in the cases I attended, most of which were such as had been given over by the doctors, caused great alarm among those professional gentlemen styled regular physicians, and I experienced the same opposition from them that I had met with in other places. I was followed by them or their spies, and all kinds of false and ridiculous reports were circulated among the people to frighten them and prejudice them against me and my medicine.

PREGNANCY—DROPSY—OVER TIME.

Soon after coming to this place, I was called on by Capt. John Alden to attend his wife, who was in a very alarming situation. She was in a state of pregnancy, and had the dropsy, and was then, as she supposed, several weeks over her time. She had been in the same situation once before, and was delivered by force, and came very near losing her life. The doctors gave it as their opinion, that if she should ever be so again she would certainly die. I told him, I did not attend on any except those who wished to purchase the right, in which cases I would give them the information. I explained to him the principles upon which my system was founded, and he purchased a right, after which I attended upon his wife, and found her very low; she had not lain in bed for three weeks, being so put to it for breath when she lay down, she was obliged to get immediately up again.

CONFINEMENT—CURE.

I carried her through a course of the medicine three times in five days, during which she was reduced in size about eight inches. Her travail then came on natural, and in about two hours she was delivered of a daughter, and they both did well. She was able to come down stairs in one week, and in two weeks was well enough to be about the house. This cure so alarmed the doctors, that they circulated a story at a distance, where the facts were not known, that I was so ignorant of this woman's situation that I killed her immediately; but the woman and her husband gave me all credit for the cure, and appeared very grateful to me for it.

SPOTTED FEVER—VIOLENT ATTACK—TREATMENT.

During the summer, a son of Capt. Alden was violently seized with the spotted fever. He was taken very suddenly, when at the pump for water, fell, and was brought into the house senseless. I attended him, and his jaws being set, administered a strong solution of Nos. 1, 2, and 6, by putting my finger between his cheek and teeth, and pouring in the medicine and squeezing it round to the back of his teeth; and as soon as it reached the roots of his tongue, his jaws came open. I then poured down more of the medicine, and soon after swallowing it his senses came to him and he spoke; he appeared to be like a person waking out of sleep. As soon as the warm effect of the medicine was over, he relapsed, and life seemed to go down with the heat. I found that I could not restore him till I could rarify or lighten the air. I laid him across the laps of three persons, shielding him from external air wiih a blanket, and put under him a pan with a hot stone in it about half immersed in hot water. While over this steam, again gave the medicine, which raised a perspiration; and as the heat raised inside life gained in proportion; and when the perspiration had gained so as to be equal to a state of health, the natural vigor of life and action was restored.

RELAX CASE—HIMSELF ATTACKED—BUTTERNUT.

I was called on to attend a woman who had a relax, and in a few visits restored her to health. One night about midnight I was sent for to visit this woman, in consequence of their being alarmed about her; the cause of which I could never learn, for on my arrival she was as well as usual.

I returned immediately home, and was soon after taken in a violent manner with the same disease, and was so bad as not to be able to do any thing for myself. Mr. Sewell attended upon me and did all he could, which had no effect. I was persuaded I should not live three days unless I could get some relief.

I had no pain, and every thing I took passed through me in two minutes. Nothing seemed to warm me. I sent and obtained some butternut bark, boiled it, and took some as strong as it could be made; as soon as it began to operate, I followed it with brandy and loaf sugar, burned together till it became a syrup. This soon put me in pain; I then followed my general rule of treatment, and was soon relieved,

SORE NOSE—PATIENT IN DANGER.

While at Portland, I was sent for to see a Mr. Mason, who was very sick, and it was expected that he would not live through the night. He had been attended by the doctors of the town, for a sore on his nose, which was much inflamed. They had given him so much saltpetre to kill the heat, that they almost killed him. I had the hardest trial to save his life of any one I ever attended, and was obliged to carry him through a course of medicine two or three times a week for three months, besides visiting him every day.

DOCTORS THREATEN.

The doctors said he would certainly die, and if he did tney meant to take me up for murder; and every means were resorted to, by discouraging him and other ways, to prevent his getting well; and when he got so as to be about, and it was decided that he was going to recover under the operation of the medicine, one who pretended to be his friend gave him a bottle of pepper vinegar.

PEPPER VINEGAR—SUSPICION OF POISON.

I had made a free use of this article in his case, and he took some of what was given him by this friend, and he soon grew worse. The man who gave him the pepper vinegar often enquired how he did, and when told that he was worse, he would say that I should kill him. I could not ascertain the reason of this patient being affected in the manner he was, until Mr. Sewell took some of the same, and was immediately taken in the same manner as the sick man. He took medicine and got over it, and a short time after took some more and was attacked in a similar manner. I then began to mistrust that there was something in the pepper vinegar, and on examining it was satisfied that it had been poisoned to destroy the patient, in order to take advantage of me. I was obliged to carry them both through a course of medicine, and they afterwards had no such turns.

PATIENT CURED.

This patient, after about three months' close attention, gained so as to enjoy a comfortable state of health. The undertaking

was very tedious on my part; I should hardly be willing to go through the same process again, for any sum whatever.

SALTPERTE A DANGEROUS POISON—ANTIDOTE.

The destructive effects of saltpetre render it the worst of any poison that I ever undertook to clear the system of. The only method I have found successful, is to give Nos. 1 and 2, and throw all of it out of the system that can possibly be done, and by steaming keep the heat of the body above it. All other poisons can be eradicated by the common course of medicine.

EXTENDED PRACTICE.

I was called on to attend the sick from all qnarters; but few of them were able to purchase the information, and many who had it have never paid any thing. The people generally were well satisfied with its utility; my friends were very zealous in introducing it among the people; but my opponents were not slack in doing every thing in their power to prejudice the public against me and the medicine. The doctors seemed much troubled at the success of the practice, many having been cured who were given over by them.

PATIENT CURED—DOCTORS OFFENDED.

One woman, who had been unable to walk for about nine months after having been confined, and the doctors could not help her, was attended by Mr. Sewell, and in a short time restored to a comfortable state of health, which gave them great offence.

PART OF TRIAL PUBLISHED.

Some of them published in the newspapers, a part of my trial for murder, in order to prejudice the public against me. I prepared an answer, but they had so much influence with the printers that I was unable to get it inserted. They then had the meanness to circulate the report that I acknowledged the fact, because I did not answer their statement. Thus have the faculty by such unprincipled conduct managed to keep the people blind to the benefit they might receive from the use of the medicine, for the purpose of keeping up their own credit, and making them tributary to themselves, without regard to the public good.

SENT FOR TO GO TO PHILADELPHIA.

In the month of February, 1815, I had an application to go to Philadelphia, and introduce my societies and system of practice in that city. Thinking it not proper to go alone, I made an agreement with Mr. John Lock to go with me, and after we got every thing prepared he started on the seventh to go in the

stage, and I chose to go by water, and sailed the same day in a vessel for New York. We had a long and tedious passage, suffering very much from the cold. We had a gale of wind which blew us off into the gulf stream, and we were 200 miles south of our port. On getting into a warmer latitude, the weather became warmer, when we were enabled to get clear of the ice, with which the vessel was much burdened, and could set some sail, and we arrived at New-York after a very rough passage of 17 days.

CASE OF FREEZING.

During the passage, one of the crew had frozen his hands and feet very badly, and when we had got where the weather became warmer he was in the most extreme pain. He said that it seemed as though the bones of his hands and feet were coming in pieces; his suffering was so great that the tears would run from his eyes and the sweat down his cheeks, with the pain. I was requested by the captain and crew to do something to relieve him. I agreed to do the best I could for him, in the cold and comfortless situation we were in. There was no place to keep a fire under decks, and the weather was so rough that we could seldom keep any in the caboose on deck. I was obliged to administer the medicine according to my judgment in the best manner I could.

TREATMENT AND CURE.

In the first place I procured handkerchiefs and cloths enough to wrap his hands and feet up in several thicknesses, then wet them well with cold water, and put him in his berth, covered well with blankets, and gave him the warmest medicine to take I had with me, and repeated it, to keep the inward heat sufficient to cause a free circulation in the limbs; and if his hands and feet grew painful, poured cold water on the cloths; and continued this course of treatment, of keeping the inward heat above the outward, by raising one and letting down the other, till I got the fountain above the stream, and in about two hours freed him from all pain, to the astonishment of all the hands on board. When I came to take off the cloths, the blood had settled under the nails and under the skin, which came off without any blister being raised, and before we arrived at New-York he was able to attend his watch.

REMARKS OF CAPT. AND CREW.

It was said by the captain and crew that this was the most ramarkable cure they had ever known, and that if he had been attended in the common form he would have lost his toes if not his feet, besides suffering much pain and a long confinement.

NO MYSTERY IN THE CASE.

It will be necessary to remark, that the greatness of this cure consisted in its simplicity. Any person could have performed the same who had come to years of discretion, by adopting the same plan, and many times be the means of saving the amputation of limbs. There is no mystery in it; the whole plan consists in keeping the determining power to the surface, from the fountain of the body, which is the stomach, from which all the limbs receive their support and warmth; and when you cannot raise the fountain sufficient to give nature its proper course, you must lower the stream, or outward heat, by keeping down the heat on the limbs, and raising the inward heat, when there can no mortification ever return from the limbs to the body, any more than a log can float against a stream.

DELIBERATION BEFORE TREATMENT.

In the case above stated, before I began to do any thing for the man, I duly considered his situation. He had been almost chilled to death by the extreme cold weather, so that his limbs had very little warmth from the body—not enough to bring them to their feeling. Until the warm weather raised a fever on the limbs faster than in the body, and in proportion as the heat in the extremities is raised above that in the body, by applying hot poultices or other similar applications, so much will the whole system be disordered, and the parts that have been injured will be extremely painful, and by a continued application of such means the fever or outward heat will increase, by the current being turned inward, till mortification takes place, when the limbs have to be taken off to save life; and in most cases the body has become so much disordered that they die after all. This may, I am confident, be avoided, by understanding my plan of treatment and pursuing it with zeal, particularly in all cases of burns or freezing.

ARRIVAL AT PHILADELPHIA.

On my arrival at New-York, I found Mr. Locke, who had been waiting for me ten days. The next morning we started in the stage for Philadelphia, where we arrived that evening, and went to a boarding house where we put up for the night. In the morning we went in search of Elder Plumer, with whom I had engaged the fall before to go to Philadelphia; we found him in the course of the forenoon, and he expressed much joy at our arrival. He preached a lecture that evening, and appointed a meeting at the same place the next evening for me, at which I attended and gave a lecture. A large collection of people attended this meeting, and I gave a full and explicit explanation of thc principles upon which my system is founded.

MEDICAL STUDENTS—ANECDOTE.

There were two medical students present, and while I was endeavoring to give a view of the formation of the animal creation out of the four elements—that heat was life and cold death—and that the blood was necessary to life, as being the nourishment of the flesh, and inasmuch as it was taken away so much was life and health diminished—one of them interrupted me, and said that cold was a promotion of life, and that bleeding was beneficial to preserve life also. I answered him by stating, that admitting his doctrine to be true, an animal that had the blood taken from it and was frozen would be the liveliest creature in the world. This unexpected retort caused a laugh, and the two medical gentlemen left the room. I then went on and concluded the explanations I wished to make, which gave general satisfaction to the people present, and sixteen signed the articles of agreement that night, to obtain the knowledge of the medicine and practice, to whom I engaged to give information by lectures. We remained there about a week, in which time about twenty bought the right.

VISITS WASHINGTON.

When we had completed our business at Philadelphia, we went on to Washington, where we remained several days, and had a view of the ruins of the public buildings which had been destroyed by the British when they took possession of that city, about six months previous to our being there.

PIPSISSEWAY USEFUL IN CANCERS.

While at the capitol, I had an interview with Gen. Varnum, and some conversation passed between us concerning the pipsisseway, which had been found useful in a case of cancer for which I attended his wife, when practising at Pelham, in the year 1807. He said, that it having been found so useful in all cancerous cases, he thought it ought to be published in the newspapers or almanacs, for the benefit of those who were afflicted with that dangerous disease, and expressed a wish that I would do it. I told him that I thought it would be better for him to publish it than for me, and he consented; and the next year he published it in the almanac, which was the cause of much speculation in this herb.

MARSH-ROSEMARY.

In the fall of the year 1815, I went to Cape Cod to procure some marsh-rosemary, and collected a quantity, carried it to Portsmouth and prepared it for use. This is the last time that I have collected any of this article, and as it becomes scarce I think I shall make no more use of it. It is too cold and bind-

SENT FOR IN HASTE.

Within a week after my return from Cape Cod, I received a letter from Eastham, to go there as soon as possible. I took a stock of medicine and went on there as soon as I could, and on my arrival found that the fever had again made its appearance among the people, with double fatality. I soon found enough ready to purchase the twenty rights, for which I had offered to sell the right of the whole town. I attended on many of those who had the disease, in company with the two men who had purchased the right of me when there before, and instructed them how to carry a patient through a course of medicine, and they attended and gave instruction to others. When they could meet together, I gave information by lectures; those who got the information attended wherever they were wanted. I pursued my usual mode of treatment, by giving the medicine to promote a free perspiration, and when necessary steamed and gave injections, cleansed the stomach and cleared off the canker.

GREAT SUCCESS.

The success in curing this alarming disease was very great. I staid about two weeks, during which time there were attended with my medicine thirty-four cases, of whom one died, and the rest got well. At the same time, of those who were attended by the regular doctors, eleven out of twelve died, making in the whole upwards of fifty deaths in a short time in this place, which was about one twelfth part of the inhabitants who were at home. The truth of the above statements is authenticated by the certificates of the selectmen of the town and other respectable inhabitants.

ABUSE REWARDED, ETC.

During my stay this time, I attended the husband of the woman who had abused me when here before, at the house of his sister. She came there while I was attending upon her husband, and treated me and him in a most abusive manner, saying that she would sooner die than take any of my medicine or have any thing to do with me. After she had vented her spite to her own satisfaction, she went home, was taken sick on the way, and was one of the last who died with the fever. The people generally treated me with great kindness and respect, and took great interest in my cause; and the success of my system of practice, in relieving them from this alarming disease, gave universal satisfaction.

I formed those who purchased rights into a society, and they chose a committee, whom I authorized as agents to sell rights and medicine.

SOCIETIES—THEIR CONSEQUENCES.

I have formed four societies, and given them certain privileges, by allowing them part of the profits on the sale of rights and medicine; but as soon as there were any funds, it has always created uneasiness among the members. Some of the ignorant and selfish would call for their dividends, as though it were bank stock, instead of feeling grateful for the advantages they enjoy by having their diseases cured, and their minds relieved from the alarming consequences of a disease, with a trifling expense.

ONE SOCIETY ONLY.

I have altered my plan, and now have but one society. Every one who purchases a right for himself and family, becomes a member of the Friendly Botanic Society, and is entitled to all the privilege of a free intercourse with each other, and to converse with any one who has bought a right, for instruction and assistance, as each one is bound to give his assistance, by advice or otherwise, when called on by a member. In this way, much more good can be done, and there will be much more good will towards each other, than where there is any money depending.

PRACTICED THIRTY YEARS.

I had now been in practice, constantly attending upon those laboring under disease, whenever called on, for about thirty years; had suffered much, both in body and mind, from the persecutions I had met with and my unwearied exertions to relieve the sick; and to establish my practice upon a permanent basis, that the people might be satisfied of its superiority over that which is practised by those styled regular physicians, putting it in their power to become their own physicians, by enabling every one to relieve themselves and friends from all diseases incident to our country, by making use of those vegetable medicines, the produce of our own country, which are perfectly safe and easily obtained; and which, if properly understood, are fully sufficient in all cases of disease, where there can be any chance of cure, without any danger of the pernicious and often fatal consequences attending the administering those poisons that the fashionable doctors are in the habit of giving to their patients.

THE SYSTEM—PRACTICE—ELIAS SMITH, AGENT.

After having discovered a system, and by much labor and constant perseverance reduced it to practice, in a manner that had given general satisfaction to all who had become acquainted with it, and having secured the same by patent, in order that

I might reap some benefit from my discovery, to support me in old age; having by a long series of attendance on the sick, both as physician and nurse, become almost worn out, I came to the determination to appoint some suitable person, who would do justice to me and the cause, as a general agent, to take the lead in practice, and give the necessary information to those who should purchase the rights, which would enable me to retire from practice, and receive a share of the profits as a reward for my long sufferings.

After considerable inquiry, I became acquainted with Elias Smith, who was recommended as a man in whom I could confide, and who was every way qualified as a suitable person to engage in the undertaking. I found him in Boston, and in very poor circumstances, having been for several years a public preacher, but in consequence of his often changing his religious principles, and engaging in different projects in which he had been unsuccessful, he was now without a society or any visible means of supporting himself and family. He readily engaged with me, and promised to do every thing in his power to promote my interest, and extend the usefulness of my system of practice.

SALE TO SMITH—MISPLACED CONFIDENCE.

I sold him a family right in December, 1816, and was in his family during the winter, for the purpose of instructing him in the practice, to qualify him to attend upon the sick, and give information to others. I put the utmost confidence in his honor, and spared no pains in communicating to him, without reserve, all the knowledge I had gained by experience, both by practice and verbal instruction, under the expectation that when he became sufficiently acquainted with the system and practice I should be rewarded for my trouble, by his faithfully performing his duty towards me, according to his promise.

I shall make no remark upon my being disappointed in all my expectations in regard to Mr. Smith's conduct, and the treatment I received from him, after he had gained a knowledge of the practice from me, to enable him to set up for himself; but shall proceed to give a short account of what took place during my connection with him.

BAD CASE OF ITCH.

The first case I attended was in his own family. The son of his wife had the itch very badly, so that nearly one half of him was a raw sore. They had tried the usual remedies without any benefit. I showed him the use of No. 3, to wash with, to stop the smarting of the sores; then took some rheumatic drops and added about one fourth part of the spirits of turpen

tine and washed him with it. This is very painful when applied where the skin is off; to prevent which, mix with it some of the wash made of No. 3; at the time of applying the above, give some of the composition, especially when going to bed, and occasionally give about fifteen of the drops, shaken together, on loaf sugar. By pursuing this treatment one week this boy was entirely cured.

AGUE IN THE FACE.

The next case, which was the first we attended together out of his family, was a young woman who had the ague in her face. I showed him the whole process of curing this complaint, which was done by putting a small quantity of No. 2 in a cloth, and placing it between her cheek and teeth, at the same time giving her some of Nos. 2 and 3 to take, and in two hours she was cured.

BAD CASE OF DROPSY.

I was constantly with him in practice from February until June, during which time we attended many bad cases, with great success.

A Mrs. Grover, who had the dropsy, came to his house to be attended. She had been given over by her doctor as incurable, and was so much swelled as to be blind, and her body and limbs in proportion. Mr. Smith undertook her case, under my direction, and carried her through a course of the medicine daily for nine days, and then occasionally once or twice a week till she was cured. She was thus attended under my inspection for three weeks, and in four was entirely cured, for which she gave Mr. Smith about forty dollars. In this case I did a great part of the labor and he got the pay.

About the third time of carrying her through a course of the medicine, I was absent. Her symptoms appeared unfavorable, and he was frightened; a nurse woman, to whom I had given information, and who had more experience than he had, came to his assistance, and by using injections relieved her, and prevented mortification.

BAD CASE, CONSTIPATION—DYSENTERY—CURED.

Another case was of a man who came to his house, who was in a declining way, and had taken a great quantity of physic before he came, which would not operate. On taking my medicine, as he began to be warm so as to cause motion in his bowels, the physic he had before taken operated, and run him down with a relax; then the dysentery set in, and he suffered much with pain, and had discharges of blood. I gave Mr. Smith directions to use injections, to clear his bowels of canker and pre-

vent mortification, but he neglected it until I told him three days in succession. He then got alarmed and sent for me, but before I arrived he had given an injection, which had relieved the patient. He remained and was attended about three weeks, and went home in a comfortable state of health. He paid Mr. Smith about thirty dollars.

BAD CASE OF RHEUMATISM.

About this time a Mr. Jennings applied to Mr. Smith, having lost the use of one of his arms by the rheumatism. He had been attended by a doctor for more than nine months, and had been given over as incurable.

ARM PERISHED.

His arm was perished, and he was in poor circumstances, having paid all he had to the doctor. He wanted relief, but said he could pay nothing for it unless he was cured, so that he could earn something by his labor. Mr. Smith asked me if I was willing to assist to cure him on these terms, to which I agreed. We carried him through a course of the medicine and steaming twice or three times a week for four weeks, when a cure was effected. The last time he was carried through was on election day, and he expressed a wish to go on the common in the afternoon, to which I gave encouragement.

PEPPER SAUCE—ITS EFFECT, ETC.

The medicine was done about ten o'clock—he was then steamed and washed all over with pepper sauce. He complained bitterly of the heat, and threw himself upon the bed; I took a spoonful of good cayenne and put in two spoonfuls of pepper sauce, and gave it to him to take. This raised the inward heat so much above the outward, that in two minutes he was quite comfortable, and in the afternoon he went on the common. His arm was restored, and he was well from that time. He afterwards, as I have been told, paid Mr. Smith forty dollars for the cure.

JOINTS OUT OF PLACE.

A Mrs. Burleigh went to his house about this time, who had the rheumatism so badly that her joints were grown out of place, and I assisted in attending her. She had never taken much medicine, which made it the easier to cure her, as we had nothing to do but to cure the disease, without having to clear the system of poisonous drugs, as is the case with most of those who apply for relief in cases of long standing. She was carried through the course of medicine several times, and steamed. The last time I attended her, and gave the medicine three times, as usual, which raised a lively perspiration and a

fresh color, showing an equal and natural circulation, but did not sicken or cause her to vomit, as is the case most generally. I mention this to show that the emetic qualities of the medicine will not operate where there is no disease. She was then steamed and washed, and went out of doors, being entirely cured of her complaint.

LAUDANUM TAKEN.

About this time Ira Smith came home, after having been absent about four years, but was not treated with that affection a child expects to receive in a father's house: he was sent off to find lodgings where he could. About twelve o'clock he returned, not being able to obtain lodgings, and called up a young man who boarded with Mr. Smith—he took a phial and drank from it, and soon after fell on the floor.

The young man being alarmed, awoke his father; and informed him of the circumstance, but before he got to his son he was senseless, and stiff in every joint. I was in bed in the house, and Mr. Smith came to me and requested my assistance, saying that he expected Ira had killed himself. He showed me a phial and asked me what had been in it; I told him it had contained laudanum. I got up as soon as possible, and on going down, met Mr. Smith and the young man, bringing Ira up stairs.

REMEDY—RELIEF.

I directed them to lay him on the hearth, and took a bottle from my pocket, which contained a strong preparation of Nos 1, 2, and 6; took his head between my knees, his jaws being set, and put my finger between his cheek and teeth, and poured in some of the medicine from the bottle. As soon as it reached the glands of his throat, his jaws became loosened, and he swallowed some of it; in five minutes he vomited—in ten he spoke—in one hour he was clear of the effects of the opium—and the next day was well.

AGAIN TAKES LAUDANUM—DIES.

About four years after, he became dejected, in consequence, as he said, of ill treatment, went over to Charlestown, took a quantity of laudanum, was found near the monument senseless, and was carried to the alms-house, where he died.

A CASE OF CROUP—EFFECT OF PHYSIC.

I went home to attend to my farm and get in my hay, after which I returned to Boston, and in the fall went to Cape Cod, and on my return to Boston I found Mr. Smith's youngest child sick with the quinsy, or rattles. He had done all he could and given it over to die. The women had taken charge of the child

after he had given it up, and had given it some physic. I told them they had done very wrong in giving physic, for it was strictly against my orders ever to give any in cases where there was canker. They observed, that there was no appearance of canker. I told them, it would never appear when they gave physic, for it would remain inside till mortification decided the contest.

TREATMENT—RELIEF.

I began with the child by giving No. 2, which caused violent struggles, and aroused it from the stupid state in which it had lain, until the moisture appeared in the mouth; then gave some No. 3, steeped, and Nos. 1 and 2, to start the canker and cause it to vomit.

ACCUSED OF CRUELTY.

The women who were present accused me of the greatest cruelty, because I brought the child out of its stupid state, and restored its sense of feeling, by which the life of the child was saved.

ACKNOWLEDGMENT.

The next morning its mouth was as white as paper with canker; they were then all satisfied that I knew the child's situation best, and that I had saved its life. I considered the child so much relieved that the father and mother would be able to restore it to perfect health—left it in their care and went out of town.

AGAIN GIVEN OVER TO DIE.

I returned the next day about noon, and found that they had again given it up to die. Its throat was so filled with canker that it had not swallowed any thing for four hours. I was in suspense whether to do any thing for the child or not, but told the father and mother I thought if it was mine I would not give it up yet: they wished me to try.

AGAIN RELIEVED—TREATMENT.

I took some small quills from a wing, and stripped them except about three quarters of an inch at the point, tied several of them together, which made a swab, dipped it in canker tea, and began by washing the mouth, then rinsing it with cold water; then washed it with the tea again, putting the swab down lower in the throat, which caused it to gag, and while the throat was open put it down below the swallow, and took off scales of canker, then rinsed again with cold water. Soon as it could swallow, gave some tea of No. 2, a tea spoonful at a time, and it soon began to struggle for breath, and appeared to be in great distress, similar to a drowned person coming to life.

CHILD AGAIN SAVED—CONFESSION OF FRIENDS.

In struggling for breath it discharged considerable phlegm from its nose and mouth; I then gave some more of the emetic with canker tea, which operated favorably; in two hours it was able to nurse, and it soon got well, to the joy of the father and mother—who said that the life of the child was saved by my perseverance.

BAD MERCURIAL CASE—TREATMENT—CURE.

Soon after this child got well, which was in the fall of the year 1817, Mr. Smith moved to Taunton. Previous to his removal, a man from that place, by the name of Eddy, applied to him to be cured of a bad humor caused by taking mercury. I assisted in attending upon him a part of the time. Mr. Smith began with him, and on the turn of the disorder the man and he got frightened and sent for me.

He had been kept as hot as he could bear, with the medicine, for six hours, which increased the heat of the body sufficient to overpower the cold, the heat turned inward and drove the cold on the outside. This produces such a sudden change in the whole system, that a person unacquainted with the practice would suppose they were dying; but there is no danger to be apprehended, if proper measures are taken and persevered in by keeping up the inward heat. In such cases steaming is almost indispensable; for which reason I have been obliged to steam the patient in most cases where the complaint has been of long standing, especially when much mercury has been taken, as nothing will make it active but heat. This man soon got well, and I returned home.

INJURIES SUSTAINED.

It has been my misfortune to meet with not only opposition in my practice, but to suffer many wrongs from some of those with whom I have had dealings, and this in many cases where those who have attempted to injure me were among those that I considered under obligations to me.

LIBERALITY IN DEALING.

In selling family rights, I have always been as liberal to purchasers as they could wish, particularly where I was convinced their circumstances made it inconvenient for them to pay the money down; and I have been in the habit of taking notes, payable at a convenient time. This has occasioned me considerable loss; but in most cases the purchasers have shown a disposition to pay if within their power—have treated me with a proper respect, and have been grateful for the favor. With these I have been satisfied, and no one has had reason to complain of my want of generosity towards him.

UNGRATEFUL RETURNS.

There have been some, however, who have taken a different course, and have not only refused to comply with their contract, but have, notwithstanding they have continued to use the medicine, turned against me, and tried to do me all the harm in their power. Such conduct has caused me considerable vexation and trouble.

SUIT ON NOTE FOR A RIGHT.

I put one of the notes in suit, and the action was tried before the Boston Police Court. The defence set up was, that the contract was void, in consequence of the failure of the patent; and also, that there was no value received.

The trial was before Mr. Justice Orne, and was managed by Mr. Morse for the plaintiff, and Mr. Merrill for the defendant. The Judge seemed unwilling to decide alone, and the case was continued for argument before the full court.

The case was argued before the three judges, who all agreed in the opinion that a decision of the Circuit Court did not affect the patent right, but was a mere suspension, in consequence of an informality in the specifications, which did not debar me from recovering according to the contract.

SECOND HEARING.

After this decision, another hearing was had, and another attempt made to prove that the defendant had not been furnished by me with the necessary information to enable him to practice with safety, but in this he failed altogether.

IMPORTANT TESTIMONY.

In the course of the trial, a great number of gentlemen of undoubted veracity were brought forward to prove the utility of my system of practice, who gave the most perfect testimony in its favor. Among the witnesses, an eminent physician of Boston voluntarily came forward, and gave a very fair and candid statement in favor of its utility, the value of my discoveries, and the important additions I had made to the materia medica.

TRIUMPHANT RESULT.

The judge took several days to make up his judgment, and finally decided in my favor, giving me the full amount of my claim; thus settling the principle, that obligations given for family rights were good in law.

This was the first time I had ever had a chance to prove the utility of my medicine and system of practice before a court of law—having always before been prevented by some management of the court.

INDEX,

To the Historical Sketch of Samuel Thomson' Discoveries and Early Practice.

DESCRIPTION OF THE VEGETABLE SUBSTANCES

USED BY SAMUEL THOMSON, TO SUSTAIN HIS SYSTEM OF VITALITY IN MATTER.

We shall be as concise in our description of the different vegetable remedies used by Dr. Thomson as possible, knowing as we do, that the patrons of this work wish his experience, and not that of the regular physicians. We shall endeavor, therefore, not to lumber the work with useless remedies, or with too many of those of others, but shall confine ourself mostly to our own experience, and to Thomsonian principles and treatment generally, without quoting as good authority those whose systems of practice we profess to have passed long since in point of correct principles and practical success. Consequently, we do not wish to retrace our steps, and again pass over the battle-field, for the sake of the fight, as the victory has already been won, and the laurels acquired.

For what, then, shall we contend? We answer, teach the people to respect themselves and their own judgment in relation to medicine, and to keep clear of the ☞ *vegetable and mineral poisons and their advocates,* ☜ for the sake of bodily health and domestic peace.

The remedies and treatment of the different diseases to which we are subject are made so plain, that any person of ordinary capacity can, by following the rules and directions in this work, practice at first in simple forms of disease successfully. And in the most violent cases with much better success than attends the practice of the most eminent physician of the old school, whose materia medica to cure the sick is composed of the most violent vegetable and mineral poisons—such as would destroy the most robust person in health, and such as the wicked have recourse to, to destroy the lives of others or to commit suicide. If arsenic, nitre, and opium, will kill those in health, when given for the purpose of destruction, will they cure the sick, when given by a man of learning, on account of his diploma? And if red raspberry, witch-hazle, and sumac, are innocent substances by nature, can they be made poisons, because administered by a man who does not understand latin, and has not obtained a diploma?

Lobelia inflata.

Indian or Wild tobacco, Eye bright

LOBELIA INFLATA.—No. 1.

Emetic Herb—Indian Tobacco—Eyebright, &c.

EMETIC, STIMULANT, EXPECTORANT, DIAPHORETIC.

To cleanse the stomach, remove obstructions, and promote perspiration.

Lobelia Inflata. *Herba Semina.* The herb and seed.—*Calyx* five cleft. *Corolla* irregular, five parted, cleft on the upper side nearly to the base. *Anthers* united into a tube. *Stigma* two lobed. *Capsule* inferior or semi-superior, two or three celled, two valved at the apex.

The lobelia inflata is a biennial, indiginous plant, usually from 12 to 18 inches in height, with a fibrous root, and a very hairy, solitary, erect, and angular stem, much branched about two thirds of the way, rising considerably above the summit of the highest branches. The leaves are scattered, sessile, acute, serrate, oval, and hairy. The flowers are disposed in numerous leafy terminal racemes, and supported on short footstalks. The segments of the calyx are linear and pointed. The flower, which is of a delicate bluish color, has a border labiate, the upper lip being divided into two, and the lower into three acute segments. The pod is an oval, inflated capsule, crowned with the persistent calyx, and containing in two cells numerous very small brown seeds.

The lobelia inflata is a very common plant, growing in pastures, on the road side, and in neglected grain fields, throughout the country. Its flowers appear towards the end of July, and continue to expand in succession until the occurrence of frost. When wounded or broken, the plant exudes a milky juice, possessing active emetic properties.

All parts of the plant are possessed of medicinal activity; but the seed, leaves, and inflated capsules, are all that are used as medicine by Dr. Thomson.

The plant should be collected in August or September, when the capsules have become a little yellow. Then the seed is ripe. The stalk should be separated between the leavs and the roots, and the herb carefully laid upon a sheet, thinly spread out to dry, in order to preserve the seed, leaves, and capsules. When thoroughly dried, take a straight stick and whip the herb, and the leaves and capsules are easily separated from the stalks, and the seeds are ejected from the capsules, all of which settle, leaving the naked stalks uppermost, which may be removed, and you have the herb and seed together. Now gather the four corners of the sheet, and the substance settles into the centre. Shake the sheet latterally several times, and you may then remove the leaves and capsules, and have the pure seed at

the bottom; or the seed may be sifted through a fine sieve, to separate it from the herb. The seed should be bottled close, and the herb may be kept in boxes, all of which should be dry.

The dried leaves of lobelia have a slight irritating odor, and when chewed, though at first without much taste, soon produce a burning, acrid impression upon the posterior parts of the tongue, and palate, very closely resembling that occasioned by tobacco, and attended in like manner with a flow of saliva, and a nauseous effect upon the stomach. The powder is of a greenish color. The plant yields its active properties readily to water and alcohol; and water distilled from it retains its acrid taste. The lobelia contains a volatile oil, upon which its odor depends, and an acrid alkaline principle, to which its effects upon the system are probably ascribable. The seed contains at least twice as much of this principle in proportion as the whole plant.

Lobelia is an emetic, and, in small doses, a diaphoretic and expectorant. The leaves or capsules, chewed for a short time, occasion giddiness, headache, tremors, and ultimately nausea and vomiting. When swallowed in full dose, the medicine generally produces vomiting, attended with copious perspiration, and a general relaxation. Its effects in doses too large, or too often repeated, are great anxiety and extreme prostration of strength, and the appearance of the patient is very alarming to those who are unacquainted with its operation; but to the practitioner those symptoms are almost an every day occurrence, consequently it gives him no uneasiness for the safety of the patient. In two or three hours the patient is through with the operation, and possesses as much vigor, if not more, than immediately previous to the commencement of the course. If this medicine does not operate as an emetic after being taken in reasonable quantities, in from three to five hours, it will pass off the same as any other harmless substance, and leave the person with a full flow of vigor and spirits, the same as if it had not been taken.

Very unlike the *tartarized antimony* or *ipecac*, is the operation of the lobelia inflata. Those articles, when taken to cause vomiting, and failing to produce the desired effect, leave the patient with a distressing nausea, that is not got rid of many times for several days. Fatal effects are frequently the result of taking tartarized antimony in too large quantities; but safe and salutary are the effects of the lobelia, in almost every form that it can be used, even by the most inexperienced hand, if he but follows the directions for its use.

The first knowledge I ever had of it, was obtained by accident more than fifty years ago, and I never had any information whatever concerning it, except what I have gained by my

own experience. A great deal has been said of late about this plant, both in its favor and against its utility as a medicine; but all that the faculty have said or published concerning it, only shows their ignorance on the subject; for there is very little truth in what they have stated concerning its medicinal properties, except where they admit it to be a certain cure for the asthma, one of the most distressing complaints that human nature is subject to. It is a truth which cannot be disputed, that all they have known about this article, and the experiments that have been made to ascertain its value, originated in my making use of it in my practice.

In the course of my practice, a number of the doctors discovered that the medicine I made use of produced effects which astonished them, and which they could not account for. This led them to conclude, that because it was so powerful in removing disease, it must be poison. This, I think, can be very satisfactorily accounted for. They have no knowledge of any thing in their system which is capable of producing a powerful effect upon the sick except what is poisonous, and therefore naturally form their opinions agreeable to this erroneous theory.

There is a power to preserve life, and a power to produce death, which of course are directly opposed to each other; and whatever tends to promote life cannot produce death, let its power be ever so great. In this consists all the difference between my system of practice and that of the learned doctors.

In consequence of their thus forming an erroneous opinion of this herb, which they had no knowledge of, they undertook to represent it as a deadly poison; and in order to destroy my practice they raised a hue-and-cry about my killing my patients by administering it to them. Some of the faculty even made oath that it was poison, and when taken into the stomach, if it did not cause immediate vomiting it was certain death. It is unnecessary for me now to point out the falsity of this, for the fact is pretty well known, that there is no death in it; but on the contrary, that there is no vegetable that the earth produces, more harmless in its effects on the human system, and no one more powerful in removing disease and promoting health.

There is no mention made of this herb by any author that I have been able to find, previous to my discovering it, excepting Linnæus, who has given a correct description of it, under the name of lobelia inflata; but there is nothing said of its medical properties; it is therefore reasonable to conclude that they were not known till I discovered the fact, and proved the plant to be useful.

When the faculty first discovered that I used this herb in my practice, they declared it to be a deadly poison; and while persecuting me by every means in their power, and representing

to the world that I killed my patients with it, they were very ready to call it my medicine, and allow it to be my discovery; but since their ignorance of it has been exposed, and they find it is going to become an article of great value, an attempt seems to be making to rob me of all the credit of causing its value to be known, and the profits which belong to me for the discovery—in which some who have been instructed by me are ready to join, for the purpose of promoting their own interest at my expense.

What is quoted in the Dispensatory, from the Rev. Dr. M. Cutler, concerning this herb, is in general correct, particularly as it regards its being a specific for the asthma, though he labored under many mistaken notions about its effects when taken into the stomach. He says, "if the quantity be a little increased, it operates as an emetic and then as a cathartic, its effects being much the same as those of the common emetics and cathartics." In this he is mistaken, for it is entirely different from any other emetic known ; and as to its operating as a cathartic, I never knew it to have such an effect in all my practice. And I certainly ought to know something about it, after having made use of it for more than forty years, and administering it in every form and manner in which it can be given, and for every disease that has come within my knowledge.

It appears that all the knowledge he and other doctors have got of this herb's being useful in curing disease, particularly in the asthma, was obtained from me; for when I was prosecuted I was obliged to expose my discoveries, to show the falsity of the indictment.

Dr. Cutler was brought forward as a witness at my trial, to prove the virtues of this plant by his testimony—that he cured himself of the asthma with it. He says, the first information he had of its being good for that complaint, was from Dr. Drury, of Marblehead. In the fall of the year 1807, I introduced the emetic herb, tinctured in spirit, for the asthma and other complaints of the lungs, and cured several of the consumption. In 1808, I cured a woman in Newington of the asthma, who had not lain in her bed for six months. I gathered some of the plants, about the size of a dollar, bruised them, and tinctured them in spirits, gave her the tincture, and she lay in bed the first night. I showed her what it was, and how to prepare and use it, and by taking this and other things according to my direction, she enjoyed a comfortable state of health for twelve years, and has not been obliged to sit up one night since. The same fall I used it in Beverly and Salem ; and there can be no doubt but all the information concerning the value of this article was obtained from my practice.

After Dr. Cutler had given his testimony of the virtues of this herb, and the doctors have become convinced of its value, they come forward and say it is good medicine in skilful hands. Who, I would ask, is more skilful than he who discovered it, and taught them how to prepare and use it in curing one of the most distressing complaints known? If it is a good medicine, it is mine, and I am entitled to the credit of bringing it into use, and have paid dear for it; if it is poison, the doctors do not need it, as they have enough of that now. Dr. Thacher undertakes to make it appear that the fatal effects he tells about its producing, were owing to the quantity given; and says I administered a tea spoonful of the powder; and when he comes to give directions for using it, says that from ten to twenty grains may be given with safety. It appears strange that different terms should produce such different effects in the operation of medicine. If a tea spoonful is given by an empiric, its effects are fatal; but if the same quantity is administered by a learned doctor, and called grains, it is a useful medicine!

It is said by Dr. Thacher, that it was employed by the aborigines and by those who deal in Indian remedies; and others who attempt to rob me of the credit of the discovery affect to believe the same thing; but this is founded altogether upon conjecture, for they cannot produce a single instance of its having been employed as a medicine till I made use of it. The fact is, it is a new article, wholly unknown to the medical faculty till I introduced it into use; and the best evidence of this is that they are now ignorant of its powers, and all the knowledge they have of it has been obtained from my practice. It would be folly for me to deny, that it may have been used by the natives of this country; but one thing I am certain of, that I never had any knowledge of their using it, nor ever received any information concerning it from them, or any one else.

This plant is common in all parts of the country. Wherever the land is fertile enough to yield support for its inhabitants, it may be found. It is confined to no soil which is fit for cultivation, from the highest mountains to the lowest valleys. In hot and wet seasons it is most plenty on dry and warm lands; in hot and dry seasons, on clayey and heavy lands. When the season is cold, either wet or dry, it rarely makes its appearance; and if the summer and fall are very dry the seed does not come up, and of course there will be very little to be found the next season.

I have been in search of this herb from Boston to Canada, and was not able to collect more than two pounds, and in some seasons I have not been able to collect any. I mention this to show the uncertainty of its growth, and to put the people on their guard to be careful and lay up a good stock of it when

plenty. In the year 1807, if I had offered a reward of a thousand dollars for a pound of this herb I could not have obtained it. I have seen the time when I would have given two dollars for an ounce of the powder, but there was none to be had; and this fact taught me to lay up all I could obtain when it was plenty.

In seasons when this herb is plenty, it may be found growing in highways and pastures, by the side of old turnpikes, and in stubble land, particularly where it has been laid down to grass the year before. When grass is scarce it is eaten by cattle, and is hard to be found when full grown. It is a wild plant, and a native of this country; but there is no doubt of its being common to other countries. It may be transplanted and cultivated in gardens, and will be much larger and more vigorous than when growing wild. If some stalks are left, it will sow itself, and probably may be produced from the seed; but how long the seeds remain in the ground before they come up, I do not know, having made no experiments to ascertain the fact. It is certain that it is produced from the seed, and there is no good reason to suppose that it may not be cultivated in gardens from the seed, as well as other vegetables. I think it most probable, however, from the nature of the plant, that it will not come up till the seeds have laid at least one winter in the ground.

This plant is different in one very important particular from all others that I have a knowledge of, and that is, that the same quantity will produce the same effect in all stages of its growth, from its first appearance till it comes to maturity. But the best time for gathering it, as has before been mentioned, is when the leaves and pods begin to turn yellow, for then the seed is ripe, and you have all that can be had of the plant. It should then be cut and kept clean, and spread in a large chamber or loft to dry, where it is open to the air in the day time, and to be shut from the damp air during the night. When perfectly dry, shake out the seed, and sift through a common meal sieve, and preserve it by itself; then beat off the leaves and pods from the stalks, and preserve them clean.

This herb may be prepared for use in three different ways, viz. 1st. The powdered leaves and pods. 2d. A tincture, made from the green herb with spirit. 3d. The seeds reduced to a fine powder, and compounded with Nos. 2 and 6.

Medical uses.—1. After the leaves and pods are separated from the stalks, grind them or pound them in a mortar to a fine powder, sift it through a fine sieve and preserve it from the air. This is the most common preparation, and may be given in many different ways, either by itself or compounded with other articles. For a common dose, take a tea spoonful of this powder, with the same quantity of sugar, in half a teacupful of

warm water, or a tea of No. 3 may be used instead of the water; this dose may be taken all at one time, or at three times, at intervals of ten minutes. For a young child, strain off the liquor, and give a part as circumstances may require.

2. To prepare the tincture, take the green herb in any stage of its growth; if the small plants are used, take roots and all, put them into a mortar and pound them fine, then add the same quantity of good spirits; when well pounded and worked together, strain it through a fine cloth and squeeze and press it hard to get out all the juice; save the liquor in bottles close stopped for use. Good vinegar or pepper-sauce may be used instead of the spirit. Prepared in this manner, it is an effectual counter-poison, either taken, or externally applied. It is also an excellent medicine for the asthma, and all complaints of the lungs. This is the only way in which the doctors have made use of the emetic herb, and they acknowledge it to be one of the best remedies in many complaints that has been found, though they know but little about it. For a dose, take from half to a tea-spoonful. Its effects will be more certain, if about the same quantity of No. 2 is added, and in all cases where there are nervous symptoms, add half a tea spoonful of nerve powder to the dose.

3. Reduce the seeds to a fine powder in a mortar, and take half an ounce of this powder, or about a large spoonful, with the same quantity of No. 2, made fine, and put them in a gill of No. 6, adding a tea spoonful of nerve powder, to be kept stopped in a bottle for use; when taken, to be well shaken together.

This preparation is for the most violent attacks of disease, such as lock-jaw, bite of mad dog, drowned persons, fits, spasms, and in all cases of suspended animation, where the vital spark is nearly extinct. It will go through the system like electricity, giving heat and life to every part. In cases where spasms are so violent that the persons are stiff, and the jaws become set, by pouring some of this liquid into the mouth, between the cheek and teeth, as soon as it touches the glands at the roots of the tongue, the spasms will relax, and the jaws will become loosened so that the mouth will open; then give a dose of it, and as soon as the spasms have abated, repeat it, and afterwards give a tea of No. 3, for canker. This course I never knew fail of giving relief.

It is good in less violent cases, to bring out the measles and small pox; and if applied to pimples, warts, &c., will remove them. I have cured three dogs with this preparation, which were under the most violent symptoms of hydrophobia; several of my agents cured patients who had been bitten by mad dogs; and I have not the least doubt of its being a specific for that disease. For a dose, take a tea spoonful.

Much has been said of the power of the emetic herb, and some have expressed fears of it on that account; but I can assure the public, that there is not the least danger in using it. I have given it to children from one day old to persons of eighty years. It is most powerful in removing disease, but inoffensive to nature. Its operation in different persons is according to their different tempers, moving with the natural current of the animal spirits.

There are two cases where this medicine will not operate, viz. when the patient is dying, and where there is no death; or in other words, when there is no disease. There can be no war where there is no enemy. When there is no cold in the body there is nothing to contend against, and when there is no heat in the body, there is nothing to kindle; in either case, therefore, this medicine is silent and harmless. It is calculated to remove the cause, and no more—as food removes hunger, and drink, thirst. It clears all obstructions to the extremities, without regard to the names of disease, until it produces an equilibrium in the system, and will be felt in the fingers and toes, producing a prickling feeling like that caused by a knock on the elbow. This symptom is alarming to those unacquainted with its operation; but it is always favorable, being a certain indication of the turn of the disorder, and they generally gain from that time.

In regard to the quantity to be given as a dose, it is a matter of less consequence than is generally imagined. The most important thing is to give enough to produce the desired effect. If too little is given, it will worry the patient, and do but little good; if more is given than is necessary, the surplus will be thrown off, and is only a waste of medicine. I have given directions what I consider as a dose in common cases, of the different preparations; but still it must be left to the judgment of those who use it, how much to give. The most safe way will be to give the smallest prescribed dose first, then repeat it till it produces the desired operation. In cases where the stomach is cold and very foul, its operation will be slow and uncertain, in which case give No. 2, which will assist it in doing its work.

When this medicine is given to patients who are in a decline, or are laboring under diseases of long standing, the symptoms indicating a crisis will not take place till they have been carried through from three to eight courses of the medicine; and the lower they have been, the more alarming will be the symptoms. I have seen some who would lay for two hours, and sob like a child that had been punished, not able to speak or to raise their hand to their head—and the next day be about, and soon get well.

In cases where they have taken considerable opium, and this

medicine is administered, it will in its operation produce the same appearances and symptoms that are produced by opium when first given, which, having laid dormant, is roused into action by the enlivening qualities of this medicine, and they will be thrown into a senseless state; the whole system will exhibit a complete mass of confusion, tumbling in every direction; it will take two or three to hold them on the bed; they grow cold, as though they were dying, remaining in this way from two to eight hours, and then awake, like one from sleep after a good night's rest—and be entirely calm and sensible, as though nothing had troubled them. It is seldom they have more than one of these turns, as it is the last struggle of the disease, and they generally begin to recover from that time.

I have been more particular in describing these effects of the medicine, as they are very alarming to those unacquainted with them, in order to show that there is no danger to be apprehended, as it is certain evidence of a favorable turn of the disease.

The emetic herb is of great value in preventing sickness, as well as curing it. By taking a dose when first attacked by any complaint, it will throw it off, and frequently prevent long sickness. It not only acts as an emetic, and throws off the stomach every thing that nature does not require for the support of the system, but extends its effects to every part of the body. It is searching, enlivening, quickening, and has great power in removing all obstructions; but it soon exhausts itself, and if not followed by some other medicine, to hold the vital heat till nature is able to support itself by digesting the food, it will not be sufficient to remove a disease that has become seated. To effect this important object put me to much trouble, and after trying many experiments to get something that would answer the purpose, I found that what is described under No. 2, was the best and only medicine within my knowledge, that would hold the heat in the stomach, and not evaporate; and by giving No. 3, to remove the canker, which is the great cause of disease, and then following with Nos. 4 and 5, to correct the bile, restore the digestion and strengthen the system, I have had little trouble in effecting a cure.

Properties.—Lobelia inflata is an emetic, stimulant, expectorant, and diaphoretic. For further description of the valuable properties of the lobelia inflata, see compounds.

CAPSICUM BACCATUM.—No. 2.

Cayenne, West India, or Bird Pepper, Chincopins.

STIMULANT, APERIENT, AROMATIC, EXPECTORANT.

To raise and retain the vital heat of the body, and promote free perspiration.

CAPSICUM BACCATUM. *Fructus.* The fruit.—*Corolla*, wheel-shaped. *Berry*, without juice.

There are several species of capsicum inhabiting the tropical Indies and America, the fruit of which, differing simply in the degree of pungency, may be indiscriminately employed.

The *capsicum baccatum*, or bird pepper, and the *capsicum frutescens*, yield the principal part of the Cayenne pepper that is brought from the East and West Indies, and from South America. The species most extensively cultivated in Europe and in this country, is the *capsicum annuum*. The two first are very shrubby plants, the last is herbaceous and annual.

CAPSICUM ANNUUM.

The stem of this plant is thick, roundish, smooth and branching, rising from 12 to 36 inches, and supports ovate, pointed, smooth, entire leaves, which are placed irregularly on long foot stalks. The flowers are white, solitary, and stand on long peduncles at the axils of the leaves. It has a persistent calyx, five cleft and tubular; the corolla monopetalous, and rather of a wheel-form, with the limb divided into five pointed, spreading and plaited segments, with short filaments, tapering, and furnished with anthers oblong; the germs are ovate, supporting a style that is slender, and longer than the filaments, and terminates in a blunted stigma.

The fruit is a pod-like, pendulous berry, smooth, light and shining, of a brightish scarlet, or sometimes of an orange color, with several cells, containing a dry, loose pulp, and flat, kidney-shaped seeds.

This plant is a native of the warmer regions of Asia, Africa, and America, and is cultivated in nearly all parts of the world. It is abundant in this country, both for medicinal and other purposes. It flowers during the summer months, and the fruit ripens in October.

There are many varieties cultived in our gardens, which differ in the shape of the fruit. The most abundant is that with a large, irregularly ovate, pendulous berry, rather depressed at the extremity, which is much used for pickling in the green state. The medicinal variety, are those with a long, pointed, conical, recurved fruit, not much thicker than the finger. We frequently meet with spherical, slightly compressed, small berries, not much exceeding the size of a large cherry. When ripe and dry, the fruit is pulverized, or ground into a fine pow-

Capsicum annuum.

Guinea red or Cayenne pepper

der, and brought into market under the cognomen of red or Cayenne pepper. The markets are also measurably supplied by importation from Africa and from the East and West Indies. There is a variety of capsicum, of very small and exceedingly pungent pods or berries, which has recently been imported from Liberia, in Africa.

Pulverized capsicum is generally more or less of a bright red, yellow, orange or straw color, which is subject to fade upon exposure to the light, and eventually to disappear. The aromatic odor is peculiar, and is stronger in the green, or new, than in the dried fruit. It is bitter in taste, pungent and acrid, producing a burning sensation in the mouth and throat, which continues for some time.

Medical use.—Cayenne pepper is an active stimulant, when swallowed producing a severe sense of heat in the mouth and stomach, and a genial glow over the whole system, and is without narcotic effect. As a medicine, it is useful in cases of enfeebled and languid stomach, and is prescribed with happy effects in most of the chronic diseases of our country.

I never had any knowledge of Cayenne being useful as a medicine, or that it had ever been used as such, till I discovered it by accident, as has been the case with most other articles used by me. After I had fixed upon a system for my government in practice, I found much difficulty in getting something that would not only produce a strong heat in the body, but would retain it till the canker could be removed, and the digestive powers restored, so that the food, by being properly digested, would maintain the natural heat. I tried a great number of articles that were of a hot nature, but could find nothing which would h ld the heat any length of time. I made use of ginger, mustard, horse-radish, peppermint, butternut bark, and many other hot things; but they were all more or less volatile, and would not have the desired effect. With these, however, and the emetic herb, together with the aid of steam, I was enabled to practice with pretty general success.

In the fall of the year 1805, I was out in search of umbil, on a mountain, in Walpole, N. H. I went into a house at the foot of the mountain to enquire for rattlesnake oil; while there, I saw a large string of red peppers hanging in the room, which put me in mind of what I had been a long time in search of, to retain the internal heat. I knew them to be very hot, but did not know of what nature. I obtained these peppers, carried them home, reduced them to powder, and took some of it myself, and found it to answer the purpose better than any thing else that I had made use of. I put it in spirit with the emetic herb, and gave the tincture, mixed in a tea of witch hazle leaves, and found that it would retain the heat in the stomach

after puking, and preserve the strength of the patient in proportion. I made use of it in different ways for two years, and always with good success.

In the fall of 1807, I was in Newburyport, and saw a bottle of pepper-sauce, being the first I had ever seen. I bought it and carried it home, got some of the same kind of pepper that was dried, which I put into the bottle; this made it very hot. On my way home, was taken unwell, and was quite cold. I took a swallow from the bottle, which caused violent pain for a few minutes, when it produced perspiration, and I soon grew easy. I afterwards tried it, and found that after it had expelled the cold it would not cause pain. From these experiments, I became convinced that this kind of pepper was much stronger, and would be better for medical use than the common red pepper.

Soon after this, I was again in Newburyport, and made enquiry and found some Cayenne, but it was prepared with salt for table use, which injured it for medical purposes. I tried it by tasting, and selected that which had the least salt in it. I afterwards made use of this article, and found it to answer all the purposes wished, and that it was the very thing I had long been in search of.

The next year I went to Portsmouth and made enquiries concerning Cayenne, and from those who dealt in the article I learned that it was brought to this country from Demerara and Jamaica, prepared only for table use, and that salt was put in to preserve it and make it more palateable. I became acquainted with a French gentleman who had a brother in Demarara, and made arrangements with him to send to his brother and request him to procure some, and have it prepared without salt. He did so, and sent on a box containing about eighty pounds, in a pure state. I sent also by many others, who were going to the places where it grows, to procure all they could; in consequence of which, large quantities were imported into Portsmouth, much more than there was immediate demand for. I was able to purchase but a small part of what was brought, and it was bought up by others on speculation, and sent to Boston. The consequence was, that the price was so much reduced that it would not bring the first cost, which put a stop to its being imported, and it has since been very scarce.

When I first began to use this article, it caused much talk among the people in Portsmouth and the adjoining towns; the doctors tried to frighten them, by telling them that I made use of Cayenne pepper as a medicine, and that it would burn up the stomach and lungs as bad as vitriol. The people generally, however, became convinced by using it, that what the doctors said about it was false, and it only proved their ignorance of its

medicinal virtues, and their malignity towards me. It soon came into general use, and the knowledge of its being useful in curing disease was spread through all the country. I made use of it in curing the spotted fever, and where it was known it was the only thing depended on for that disease.

I have made use of Cayenne in all kinds of disease, and have given it to patients of all ages, and under every circumstance that has come under my practice; and can assure the public, that it is perfectly harmless, never having known it to produce any bad effects whatever. It is no doubt the most powerful stimulant known; its power is entirely congenial to nature, being powerful only in raising and maintaining the heat, on which life depends. It is extremely pungent, and when taken sets the mouth as it were on fire; this lasts, however, but a few minutes, and I consider it essentially a benefit, for its effect on the glands causes the saliva to flow freely, and leaves the mouth clean and moist.

The only preparation necessary, is to have it ground, or pounded to a fine powder. For a dose, from one half to a tea spoonful may be taken, in hot water, sweetened; or the same quantity may be mixed with either of the other numbers when taken. It will produce a free perspiration, which should be kept up by repeating the dose, until the disease is removed. A spoonful, with an equal quantity of common salt, put into a gill of vinegar, makes a very good sauce to be eaten on meat, and will assist the appetite, and strengthen the digestion. One spoonful of this preparation may be taken to good advantage, and will remove faint, sinking feelings, which some are subject to, especially in the spring of the year. Pepper-sauce is good for the same purpose. A tea spoonful of Cayenne may be taken in a tumbler of cider, and is much better than ardent spirits. There is scarcely any preparation of medicine that I make use of, in which I do not put some of this article. It will cure the ague in the face, by taking a dose, and tying a small quantity in a fine cloth and putting it between the cheek and teeth, on the side that is affected, sitting by the fire, covered with a blanket. It is good to put on old sores.

RED PEPPERS.

These are very plenty in this country, being cultivated in gardens, and are principally made use of for pickling, for which purpose the pods are gathered when green and preserved in vinegar. They are of the same nature as Cayenne pepper, but not quite so strong, and are the best substitute for that article that I have ever found. For medical use, they should not be gathered till ripe, when they are of a bright red color. They should be reduced to a fine powder, and may be used instead of Cayenne, when that article cannot be obtained.

ZINGIBER OFFICINALE.—No. 2, continued.

Common Ginger.

EXPECTORANT, AROMATIC, STIMULANT, AND CARMINATIVE.

Its uses the same as Cayenne, but less active.

Zingiber Officinale. *Radix.* The root.—The *flowers*, spathaceous. Inner limb of the *corolla* with one lip. *Anther*, double, with a simple recurved horn at the end. *Germen*, inferior. *Style* enclosed in the furrow formed by the anther.

The ginger root is creeping, perenneal, tuberous, and has a stem which is annual, and rises two or three feet in height, and is erect, round, solid, and enclosed in a membranous imbricated sheathing.

The leaves are acute, smooth, lanceolate, from four to six inches in length, by about an inch and a half in breadth, and stand irregularly on the stalk. The flower stalk rises by the side of the stem, from six to twelve inches high, and like it is clothed with accuminate sheaths, but is destitute of leaves, and terminates in an obtuse, imbricated spike.

The flowers are yellowish, and appear several at a time, between the bracteal scales.

In Hindostan, this plant is indigenous, and it is cultivated in most parts of the East Indies, and of late in the West Indies also, having heen introduced there from the East.

The flowers are aromatic, and when the stems are bruised they are fragrant. The root is dug for use when about a year old. The crop is gathered in the West Indies in January and February, after the stems have decayed.

After being cleansed, the root is scalded in boiling water, to prevent its growing, and is then dried for market. Thus prepared, it is the ordinary ginger of commerce. It is mostly imported from Calcutta, and is known by the name of East India ginger.

In the West Indies another quality is prepared, by taking the best roots and removing their epidermis and drying them carefully in the sun. This is the *white* ginger of the shops, and is the most valuable. It comes from England, where it undergoes further preparation, by which it is much improved. It is called in this country, Jamaica ginger. The root is frequently brought from the West Indies in a green state, and is used and sold by the confectioners. The preserved ginger is made from young and tender roots, by removing their cortical covering, and boiling them in a syrup of sugar. It is translucent and tender when good.

The green roots are an inch or more in length, somewhat flat on their upper and under surface, and knotty, and branchd irregularly, or lobed—externally of an ash color, internally

fleshy and yellowish white. It frequently germinates while in the shops.

Medical uses.—Ginger is a pleasant stimulant, and is often given to remove pain from the stomach and bowels, and the deranged state of the digestive organs attendant upon gout. When chewed, it produces a copious flow of saliva; and when snuffed in the form of powder it excites sneezing. It is a useful remedy in paralysis of the tongue and fauces. It may be given in powder or infusion. The dose of the former is from half to a tea spoonful. The infusion may be prepared by adding half an ounce of the root bruised or powdered to a pint of boiling water, and may be given in doses of from one third to two thirds of a tea cup full, which may also be sweetened, with the addition af a little milk, which will render it very palateable.

This article may be used as a substitute for Cayenne, and stands second in rank to the peppers for its stimulating properties, and may be used to good advantage as a substitute, when capsicum cannot be procured.

For pulmonary complaints, it has been proved a valuable remedy. The writer of this article was attacked with bleeding at the lungs. In addition to the usual courses of medicine, he was in the constant use of this article as a substitute for stronger stimulants. His method of preparing and using it was, to select the best and most perfectly cured roots, and remove the cuticle, or the outside bark—then divide the root longitudinally through the centre, and put one half into his mouth, as he would tobacco; and the saliva would be immediately excited, from the stimulus which he swallowed, thus keeping the mouth, throat and stomach, under a gentle excitement; and as the root became soft and divided by maceration, he swallowed the particles, and in the course of an hour or two it was gone, and a new supply was taken in the same way; thus he kept in the constant use of this plant for months, until the difficulty was entirely eradicated and his lungs healed. At night on going to bed he would take a piece of the root into his mouth, where it would remain until the next morning, and before leaving his bed he would masticate and swallow what remained in his mouth, which would warm his stomach and lungs, and then on leaving his bed he was sufficiently warm to prevent taking cold. Thus was a constant stimulant kept up day and night for months, which kept the animal warmth so steady and regular that the orifice was healed.

Every person who has had a difficulty of the lungs, well knows the danger that is attendant upon exposure, in this changeable and often frigid climate. Those who have been restored to health from that complaint, are aware of the great difficulty in keeping the system in that extremely delicate and ge-

nial temperature, so highly important for their welfare. Such patients usually have had recourse to the West India climate, where the constant, steady, and genial rays, of a tropical sun, furnish nearly the same temperature naturally that we produce for ourselves artificially. Why shall we go to the West Indies to produce a change in the system by the natural temperature, when the same in effect can be brought about by artificial means in our own climate? The experiments upon the writer justified and have proved his theory correct.

PIPER NIGRUM.—No. 2, continued.

Black Pepper.

STIMULANT, ASTRINGENT, AND AROMATIC.

A substitute for Cayenne pepper—but more astringent and less active.

Piper Nigrum. *Baccæ.* The berries.—The *vine* of the pepper plant is perenneal, with a smooth, round, woody stem; with swelling joints, branched, and from twelve to fourteen feet in length. The *leaves* are broad, ovate, acuminate and entire, coriaceous, seven nerved, very smooth, and dark green, attached by foot stalks to the joints of the branches. The *flowers* are sessile, white and small, covering a cylindric spadix very thickly, and succeeded by red globular berries, when ripe.

This vine is a native of Cochin-China, and various parts of the East Indies. The vine is cultivated from cuttings, and is sustained by trees or props of various kinds, that are arranged for the purpose, upon which it is trained to adhere. In from two to six years from the time of planting, it begins to bear. The berries are gathered from the vine before they are all ripe, and when dried become wrinkled and black.

The *white pepper* is the berry deprived of its skin when ripe, by maceration in water and subsequent friction, after which it is dried. The peculiar virtues of the spice are less in the white than in the black pepper, and it is but little used in the United States.

Properties.—The dried berries of white pepper are about the size of small peas, hot and pungent, of an aromatic smell and a very fiery taste. To alcohol or water they yield their virtues.

Medical use.—White and black pepper are warm and active stimulants, capable of producing great internal or external excitement, always acting with great energy, on whatever part it may be applied Its medicinal virtues are, to create perspiration, and excite the surface, and torpid stomach, and to remove flatulence. This article is frequently used for the cure of fever and ague. When perfectly pure it is inert. This may be

[illegible]

Myrica cerifera.

Bayberry. Candleberry Myrtle

used to good advantage as a substitute for Cayenne, when that article cannot be had. Dose—from a fourth to a tea spoonful. It may be taken in the berry or in the powder, but is more active in the latter.

REMEDIES FOR CANKER.

MYRICA CERIFERA.—No. 3.

Bayberry—Candleberry—Wax-Myrtle.

ASTRINGENT, STIMULANT, EMETIC, STERNUTATORY.

To cleanse the stomach and bowels, by removing the canker.

MYRICA CERIFERA. *Cera—Cortex.* The wax and bark. —This is a diœceous, tetandrous plant. *Aments*, oblong. *Calyx*, ovate scales. *Corolla*, none. Fem *flower*, purple and green. *Styles*, two. *Drupe*, one-seeded. This shrub is known by its wedge-shaped, lanceolate leaves, and by its lax aments, and its spherical naked fruit.

The bayberry, or wax myrtle, is an aromatic bush or shrub, growing from three to ten feet in height, and is found in almost all parts of New-England, and in some of the southern states. The fruit is closely attached to the stem and branches, grows in clusters, of a greenish color, and covered with a coating of wax, which may be separated in hot water for use. The bark of the root possesses medical properties. It is acrid and astringent, and an emetic when taken in large doses.

The roots should be dug in the spring before it puts forth its leaves, and cleansed from the dust, then pounded with a mallet or hammer, when the bark will peel from the root with very little trouble. It should be dried in a chamber or loft where it will not be exposed to the weather, and when perfectly dry, it should be ground or pulverised to a fine powder. It is an excellent article, and its grade I think should be number *three*, in the class of useful medicines.

This valuable article may be taken separately, or compounded with other substances, and is the best remedy for canker that I have ever found. It is highly stimulating and very pungent, pricking the glands, and causing the saliva to flow freely. It is an admirable article to cleanse the teeth and mouth, and to remove the scurvy from the gums. If taken, about a tea spoonful of the fine powder in water once a day, for a few days in succession, it removes the most offensive breath, by correcting the secretions. It will also remove the water-brash—bad taste

in the mouth—faintness at the stomach, recent attacks of diarrhœa, and general derangement of the bowels. Taken as snuff, it clears the head and relieves the headache, and operates as a sternutatory, causing violent sneezing. When the stomach is out of order, its operation is excellent as an emetic. For a dose, take a teaspoonful or more, in a little hot water, sweetened.

The process of collecting the wax is simple. The berries are boiled in water, and the wax, melting and floating on the surface, is either skimmed off and strained, or allowed to concrete as the liquor cools, and is removed in the solid state. To render it pure, it is again melted and strained, and then cast into large cakes. It is collected in large quantities in the New-England states, and exported to other parts of the country. Myrtle wax is of a pale greenish white color, more brittle than bees-wax, or a slight odor and bitterish in taste. It is about as heavy as water, and melts at 106 degrees Fahrenheit.

Medical use.—This variety of was has been employed in this country as a remedy for relax and dysentery, and great benefit has resulted from its use in these complaints. The method was by administering the wax, either grated or powdered fine, in tea spoonful doses, in a mucillage, or syrup, repeated as often as necessary. It is occasionally substituted by druggists for bees-wax in making plasters, and is used in the preparation of tapers and candles. It is somewhat fragrant in burning, but emits a less brilliant light than lamp oil. The bark is compounded into composition and various other articles for canker.

NYMPHÆA ODORATA.—No. 3, continued.

White Pond Lily.

ASTRINGENT, TONIC, BITTER.

To clear the coats of the stomach and bowels of canker.

NYMPHÆA ODORATA. *Flores—Radix.* The flowers and roots.—*Leaves*, round, cordate, entire, sub-emarginate. *Lobes*, spreading asunder, acuminate, obtuse. *Petals*, equalling the four leaved calyx. *Stamens*, from sixteen to twenty, radiating in erectish lines.

The white pond lily is an indigenous, herbaceous, perennial plant, growing in nearly all the states, in small sluggish streams and fresh water ponds. It is much celebrated on account of the beauty and delicious odor of its large white flower. Its root is large and fleshy when green, but becomes very light and spongy by drying. It is very astringent, and a strong bitter, and contains much tanning matter.

Nymphaea odorata.

White pond lily

The roots should be dug in the fall of the year, when the ponds are low, and washed clean, and split into strips and run upon strings or spread thin to dry, in the same manner that apples are dried by the country people. After it has become thoroughly dried, it should be pulverized fine, and preserved for use.

From the astringent properties of this plant, I have placed it under the grand division of No. 3, and next in rank for its medical virtues to the myrica cerifera, or bayberry.

Medical use.—The nymphæa odorata is a valuable astringent and antiseptic, useful in all complaints of the bowels, given either in infusion alone, or compounded with other articles.

A preparation may be made called the *syrup of lilies*, in the following manner. Take a handful of the flowers, steep them moderately in a quart of water, over a slow fire, for an hour; then strain, and sweeten well with loaf sugar, grate in a little nutmeg, and add a half pint of brandy. This is an excellent article for children when teething, or in looseness of the bowels. Mothers will find this an excellent remedy also for what is called the nursing sore mouth.

A strong tea of the root is one of the best articles in my materia medica for cleansing old sores, ulcers, and even fresh wounds and bruises. Compounded with bayberry, (myrica cerifera) witch-hazle, (hamamelis virginica) and red raspberry leaves, it is extensively used for enemas, or injections, in courses of medicine. In poultices, it is used to good advantage, prepared in the following manner. To a tea spoonful of the fine powder, add a gill of boiling water, a tea spoonful of slippery elm, (ulmus fulva) stir well together, then thicken with Indian meal, or what is better, (if they can be had) Boston crackers made fine. This poultice may be applied with great advantage to ulcers, old sores, biles, whitlows, and fresh bruises or cuts where there is a high state of inflammation, to reduce the swelling. In all cases it is an excellent sedative to ease pain, in form of a poultice.

PINUS CANADENSIS.—No. 3, continued.

Hemlock Tree.

ASTRINGENT, TONIC, EXPECTORANT, DIURETIC.

For canker, compounded.

Pinus Canadensis. *Cortex.* The bark.—*Leaves*, flat, denticulate, two-ranked. *Strobiles*, ovate, terminal, scarcely longer than the leaves.

This is the hemlock spruce of the United States and Canada.

When full grown, it is often from seventy to one hundred and fifty feet high, with a trunk two or three feet in diameter, and of nearly the same size for two thirds of its length. The branches are slender and dependent at their extremities. The leaves are six or eight lines in length, and are very numerous, flat, denticulate, and irregularly arranged in two rows. The ovate strobiles are longer than the leaves, and situated at the ends of the branches.

The hemlock tree is abundant in the eastern states and the British provinces, and is also found in the mountainous regions of the midd e and western states. The bark is much used in the United States for tanning. Its juice is much less abundant than that of other species of the pine. In many of the trees which have begun to decay, the juice exudes spontaneously, and concretes upon the bark, by the partial evaporation of its essential oil. Thus encrusted, the bark is stripped from the tree, broken into pieces, and boiled in water. The gum melts and rises to the top of the water and is skimmed off, and is frequently further purified by a second boiling; it is then brought to market, in dark brown brittle masses, which exhibit small fragments of bark scattered through the substance. From this state it is purified by the druggists, by melting and straining it through canvas, sackcloth, or a fine sieve. Thus prepared, it is of a dark yellowish brown color, and becomes more so by exposure to the air. It contains resin, and a small portion of essential oil. This substance is known by the name of *hemlock gum.*

Medical use.—The bark is cleared of the epidermis, dried, pulverized, and compounded in various ways. See composition.

The hemlock gum may be made emollient, by melting it and adding bees wax and hog's lard or sweet oil; and when reduced to a proper consistency—not too soft—it may be used for strengthening plasters. And by adding a little capsicum, you make an excellent rheumatic plaster. By a still greater reduction with lard, and the addition of a small quantity of bees wax and a little balsam of fir, it makes an excellent salve for cuts, bruises, or wounds. A tea made of the boughs is a diuretic, and is very strengthening to the kidneys and small of the back. The boughs may also be used as a substitute for hops in the preparation of small beer, and furnish an excellent addition to what is generally denominated *root beer.* The boughs may also be boiled down, and a thick resinous extract obtained, that may be used for the same purposes as the gum.

Statice limonium.

Marsh rosemary. Sea lavender.

STATICE LIMONIUM.—No. 3, continued.

Marsh-Rosemary—Sea-Lavender.

BITTER, ASTRINGENT, TONIC, AND EMOLLIENT.

For canker, thrush, sore throat, and dysentery.

MARSH-ROSEMARY. *Radix.* The root.—*Calyx*, one-leaved, entire, plaited, scariose. *Petals*, five, *Seed*, one, superior.

This is a maritime, indigenous, perennial plant, growing on salt marshes, and has thick tufts of leaves, which are obovate, obtuse, entire, mucronate, smooth, and supported on long slender foot-stalks. The leaves are flat on the margin. The flower-stem is round, smooth; and a foot or more in length, and near its summit sending off numerous alternate branches, which terminate in spikes, and form altogether a loose panicle. The flowers are small, bluish purple, erect, upon one side only of the common peduncle, with a macronate scaly bract at the base of each—a five angled, five toothed calyx, and spatulate, obtuse petals.

The marsh-rosemary grows in the salt marshes along the whole extent of the North American sea coast. It flowers in August and September. The root, which is the part used in medicine, is large, spindle shaped, fleshy, compact, and of a purplish-brown color. It is bitter, and extremely astringent to the taste. It contains large quantities of tannin and gallic acid, and some common salt. Water and alcohol extract its virtues.

Medical uses.—Statice is powerfully astringent, and in the New England states is much employed for medicinal purposes. It may be used with good advantage in most cases where any of the astringent articles under the head of No. 3 are recommended. Its most popular application by the inhabitants along the sea board is for *aphthous* and ulcerative affections of the mouth and fauces. It has been found highly useful in decoction with red raspberry and sumac leaves, and a small quantity of capsicum, and lobelia sufficient to vomit, for the *cynanche maligna*, or putrid sore throat. An infusion of the roots of this plant with capsicum and witch-hazle leaves, and a small quantity of salt, is much esteemed as a gargle, by those who have used it for that distressing complaint. A strengthening plaster, with a little cayenne added, snugly applied to the neck and covered with two or three thicknesses of flannel, is a very great assistant to the above medicine in that complaint.

RHUS GLABRUM.—No. 3, continued.

Sleek Sumac.

ASTRINGENT, REFRIGERENT, TONIC.

To scour the alimentary canal of its viscid coating.

RHUS GLABRUM. *Baccæ—Folia—Cortex—Radix.* The berries, leaves, bark and seed.—The *calyx*, five parted. *Petals*, five. *Berry*, small, with one nuciform seed.

Of this genus there are several species which possess poisonous properties, and should be carefully distinguished from that here described. In botany they are more particularly designated under the head of *toxicodendron*.

Rhus Glabrum.—This species of rhus, called smooth sumac, or upland sumac, is an indigenous shrub, from six to fourteen feet high, with a stem usually much bent, knotty, and divided into numerous branches, which are covered with a smooth, light grey bark. The leaves are situated upon smooth petioles, and consist of many pairs of leafets opposite, with an odd one at the extremity; all of which are serate, lanceolate, acuminate, glabrous, green on the upper surface, but of a dusky white beneath. In autumn their color changes to red. The flowers are reddish green, and disposed in large, terminal, compound thyrses, which are followed by dense clusters of small crimson berries, covered with a very soft down.

This shrub is found in all the northern and middle states, growing in neglected fields, along fences, and on the borders of woods, and on high mountains. The flowers appear in July and August, and the fruit ripens in the early part of fall. The leaves and bark are astringent, and much used in tanning morocco leather, and in dyeing cloth. Excrescences are produced under the leaves, much resembling galls in character, and containing large quantities of tannin. These have been used as a substitute for imported galls, and are said to be preferable in every respect. They may be collected with little expense, as they are produced very abundantly, especially in the western states. The bark, leaves and berries, are used in the Thomsonian practice. The berries have a sour, astringent, and not unpleasant, taste, and are often eaten, with no bad consequences.

Medical uses.—Sumac berries, bark and leaves, may be used as medicine. The first knowledge I had of the virtues of this tree was in 1807, when in Jericho, Vermont, attending the dysentery. I was much in want of something to clear the stomach and bowels of canker in that complaint. While in search of some vegetable substance suitable for that purpose, I accidentally tasted the sumac, and from the roughness imparted I

Rhus glabra

Sluk or Small sumack

Hamamelis virginica.

Witch hazel.

was at once satisfied it was the article I needed. I gathered a quantity, and on application it more than answered my expectations; and I have been in the constant use of it since. For medicine, the bark should be gathered when full of sap—the leaves when full grown, and the berries when ripe. They should be carefully dried, and when used as a part of No. 3, should be powdered, and the different parts used altogether, or alone. The bark of the roots, divested of the epidermis, or outer coat, is considered almost a specific in the sore mouth attending inordinate mercurial salivation.

The inner bark of sumac may be boiled in milk and used to good advantage in the bloody flux. Used in this way, it contains a mucillage, that will impart a soothing sensation to the bowels, that is very agreeable to the patient. By using a wine-glass of equal parts of gin and molasses or loaf sugar, while under the operation of the above preparation, the very best results may be anticipated. The gin will act as a nervine, and will quiet the bowels, and stop the distressed, forcing sensation downwards; and thus, while under this influence, the healing properties of the sumac and milk are left to act upon the irritable coats of the bowels, and in many cases the force of the disease is entirely broken before the antispasmodic properties of the stimulant have left the body. I have seen patients relieved from this distressing disease in a very short time by the above treatment, and by quieting the nervous system, they were completely happy in mind, and relieved in body.

I have also used the red raspberry, witch-hazle leaves, and the Walpole tea (*Cænothus Americanus*) for the same complaints, and compounded it in the same manner and form.

HAMAMELIS VIRGINICA.—No. 3, continued.

Witch-Hazle.

BITTER, ASTRINGENT, DISCUTIENT, EXPECTORANT.

To remove canker from the stomach and bowels.

HAMAMELIS VIRGINICA. *Folia—Cortex.* The leaves and bark.—*Leaves*, obovate, acute, toothed, cordate, with a small sinus. Flowers in the fall, and perfects the fruit the next summer. A shrub, from six to twelve feet high.

Witch-hazle is an indigenous shrub, growing in almost all sections of North America, generally on stony places on elevated ground, and frequently on the banks of streams, or borders of swamps. Its yellow flower is remarkable for its late appearance, which expands in September or October, and continues till late in the fall. The fruit, which resembles a hazlenut, ri-

pens in the following autumn, and is frequently mingled on the same bush with the new blossoms. The bark has a sweetish bitter, pungent and astringent taste.

Medical uses.—It is excellent as a discutient, applied to painful tumors, and other cases of external inflammation. It is used in the form of poultices, or as a wash in decoction, for hemorrhoidal affections and ophthalmia. The leaves possess the same qualities as the bark, and may be given in decoction, internally, for bowel complaints and hemorrhage. The seeds are black and shining externally, white, oily, and farinaceous within, but are less edible than the hazlenut. I was first made acquainted with the article as a medicine when quite young, and have continued its use through the whole course of my practice. Its value consists in its astringent, stimulating, and healing properties.

A tea of the leaves may be used freely and with great advantage, for bleeding at the stomach and lungs, as it is a powerful styptic. I have known several cases cured, by chewing the green leaves and swallowing the juice. In some cases the canker destroys the blood vessels, and hemorrhage and ulceration take place. In such instances, this article is calculated, if judiciously applied, to remove the purulent matter and keep the orifice cleansed while the sore is healing. I have made much use of a strong tea of the leaves for injections, and have found them serviceable in all complaints of the bowels. For the piles, bearing down pains, and other complaints common to females, this decoction, with the addition of a little of No. 2, is an excellent remedy, whether for abdominal or uterine difficulties. The medicine must be applied to the affected parts with the appropriate instruments. The bearing down pains are speedily relieved by such a course of treatment.

Witch-hazle leaves may be used in connection with the other articles of No. 3, or they may be used alone as a substitute for the other articles, in all cases. The pulverized leaves, used as snuff, are an excellent remedy for bleeding at the nose.

RUBUS STRIGOSUS.—No. 3, continued.

Red Raspberry.

ROUGH, BITTER, EXPECTORANT, TONIC.

To remove thrush, discuss ulcers, and cleanse sores.

RUBUS STRIGOSUS. *Folia.* The leaves.—The *leaves* unarmed, rigidly hispids; leafets three, or pinnate-quinate, oval, at the base obtuse, acuminate, marked with lines, and white-downy beneath. *Calyx*, acuminate. *Flowers*, axillary, solita-

Rubus strigosus.

Red raspberry

ry at the ends of the branches—white. *Peduncles* and *calyx*, hispid. *Berries*, red, sweet. *Ascines*, very slightly attached.

The *red raspberry* leaves and berries are the only parts of the plant used by me as medicine. When at Eastport, Me., in 1811 or 12, I was much in want of some article good for canker; so I had recourse to my usual method, of tasting and chewing, to ascertain the medical virtues of plants. I found that the leaves when chewed caused a rough sensation in the mouth, excited the salival glands, caused a free expectoration, and left the surface of the mouth moist, pliable, and the sense of taste as acute as ever. An article possessing such qualities, I have always found to be serviceable in all cases where canker medicine was required. I gathered a quantity of the leaves at the time and dried them, and have made use of them for canker and complaints of the bowels, with great success, ever since. For relax and bowel complaints of children, and in teething, it is the best remedy I have ever found. The tea given in drink and by injections, generally affords immediate relief.

Raspberry leaves may be used freely as a substitute for imported tea, (thea Chinensis) with no apprehensions of danger. It is the best thing for a woman in travail of any article I know of. In such cases it should be given in strong tea, with a little of No. 2, sweetened. It will bring on the labor pains regularly, and reduce the irregular pains to order and regularity, thus affording rest to the patient in the intervals. If the pains are untimely, it will quell them. If timely and lingering, give more of the tea, with a larger quantity of No. 2, and umbil, or nerve powder. This will assist the natural functions of the body, and thus hasten the labor. And if this is given, in the intervals the patient will be quiet, and rest in the same proportion as the labor pains were severe. Thus the woman's strength and courage are kept up, and she is ready to meet the next attack, thus continuing till the child is born.

Should a relaxation of the system be necessary before the child is born, in consequence of the size of the fœtus, or of the thick set frame and close habit of body of the woman, add to half a cup of this tea as before mentioned, in which No. 2 and umbil have been put, a teaspoonful of brown emetic (the seeds of the lobelia inflata pulverized) and give the patient this, and if necessary an injection of the same preparation. Keep the woman covered as warm as may be comfortable, and these are the best *forceps* that were ever applied, to bring the head of a child through a contracted *pelvis*.

After taking the lobelia as above directed, the muscular power of the whole system is relaxed, and with the general relaxation, takes place that of the cartilaginous substances of the bones

of the pelvis, which dilate mechanically, and when the child is born they contract as regularly to their places. The same is also the case with the uterus. All that is necessary after this medicine has prepared the patient, is for the midwife to direct the head of the fœtus to and within the bones of the pelvis, by elevating or depressing, as the circumstances of the case may require.

After the child is born, give it some of the raspberry leaf tea occasionally, sweetened, with milk. This will prevent the sore mouth, so much dreaded by mothers. The raspberry tea is also good as a wash for sore nipples. An excellent poultice for burns or scalds may be made, by taking a tea of this article, and thickening it with fine Indian meal, Boston or sponge crackers, made fine, with the addition of a little slippery elm. If the skin is off, by applying this poultice or washing with the tea, the smarting will be stopped. The red raspberry may be used with the other articles of No. 3, or it may be substituted for any of the others, or be used by itself, to good effect. Every family ought to have on hand a supply of the prepared leaves, as almost a universal remedy.

CEANOTHUS AMERICANA.—No. 3, continued.

Red-Root, American, Walpole, Liberty, or New-Jersey Tea.

ASTRINGENT, TONIC, EMOLLIENT AND QUIETING.

For dysentery, and soreness of the stomach and bowels.

Ceanothus Americana. *Folia—Radix—Semina.* The leaves, roots, and seeds.—*Leaves*, ovate, acuminate, serrate, three-nerved, pubescent beneath. *Panicles*, axillary, long peduncles, sub-corymbed.

The *Walpole* or *American tea*, is a small, indiginous shrub, growing on pine plains, throughout the United States. The root is astringent, and imparts a red color to water. It is said to be useful in syphilitic complaints, in which it is given in the form of decoction, made in the proportion of one ounce of the green roots, well bruised, put into one pint of soft hot water. In some cases it is a purgative. The leaves were used during the revolutionary war as a substitute for tea.

Medical uses.—The leaves and seeds of this plant, when bruised, or masticated in the mouth, are astringent and mucilaginous. For the summer complaint, or looseness of the bowels in children, this is an admirable remedy, for which it is equal to any shrub in our materia medica. In taste, it somewhat resembles the *Thea Bohea*, or bohea tea; and from its similarity to that article in its aromatic taste, it has been by some denomi-

nated *American Bohea.* It may be used the same as the imported tea, with milk and sugar. It is a good remedy, with the addition of a little Cayenne, employed as a gargle, for aphthous, inflammatory or putrid sore throat, and also in sore mouth. It is a tonic, and not only useful as a medicine, but is a cheap and healthy substitute for imported tea. For the dysentery or other cases of canker, the green leaves may be masticated and swallowed in substance, or they may be steeped and the tea used to good advantage, whether green or dry. The leaves may be boiled in milk, sweetened, and used in dysentery, or relaxed state of the bowels, and is an excellent remedy to remove any kind of soreness of the bowels, occasioned by too great an irritation of those parts.

ASTER HYSSOPIFOLIUS—No. 3, continued.

Cocash—Squaw-Weed—Starflower.

AROMATIC, STIMULANT, ASTRINGENT, ANTISPASMODIC.

For canker—but less used than the preceding articles under this head.

ASTER HYSSOPIFOLIUS. *Radix.* The root.—*Leaves*, linear, lanceolate, three-nerved, punctate, acute; margin scabrous; branchlets, level-topped, corymbed, compact. *Rays*, about five flowered. *Calyx*, imbricate, twice as short as the disk, from twelve to twenty-four inches high.

The *Squaw-Weed* grows in meadows, on the margin of rivulets and marshy grounds. The flower is about the size of a sixpence, including disk and rays. The disk is yellow, and the rays purple, or of a purplish white. It blossoms late in the fall, the flowers remaining until the frost kills the rays, which fall off, and the seed is perfected. The root lives through the winter, and young stalks shoot forth in the spring.

Medical uses.—The roots and top are used as medicine; the root is very aromatic, the fragrance much resembling *castor fiber.* It was the first thing I ever knew used for canker—and was given to me when I had the canker rash, (scarlatina) being then considered the best article known for canker. I have frequently used it for that complaint, and found it to answer an excellent purpose.

Take the green roots and leaves, bruise them and pour on hot water, and let it infuse for fifteen or twenty minutes; then pour off, and add sugar and milk. By adding a little spirits to the tea it may be preserved, and is a good remedy for rheumatic and nervous affections. It is a harmless article, and may be

used freely. Tinctured in spirits and water, it makes a very good bitter, and is good for vertigo, and coldness of the extremities.

GUEM VIRGINIANUM.—No. 3, continued.

Avens Root—Chocolate Root.

BITTER, ASTRINGENT, AROMATIC, AND TONIC.

To be used for canker, and general derangement of the digestive organs.

GEUM VIRGINIANUM. *Radix.* The root.—This plant is herbaceous and perennial, with branching, erect, slender, hirsute stems, from twelve to twenty inches high. The *leaves* are serrate, hairy, and petiolate. On the upper part of the stalk the leaves are simple and pointed; those nearest the root, pinnate, with two pairs of leafets. The *flowers* are of a bright yellow color, small, and situated upon erect, terminal peduncles. The *seeds* are collected in a roundish cap-like pod, and have at the top a naked awn, and much covered at the apex.

Medical uses.—This root is much prized by those acquainted with its properties, for its tonic and astringent virtues. In the Thomsonian practice it is used with those articles embraced under the head of No. 3, such as crane's-bill, bayberry, witch hazle, hemlock, &c., for complaints of the bowels, dysentery, leuchorrhœa, &c.

The root, pulverized, is used by people in many parts of the country as a beverage with their meals, and is denominated chocolate, from its flavor resembling that article of diet, when prepared with milk and sugar. Hence is called by some chocolate root.

It is an excellent article for sore mouth, and may be used to great advantage with children when teething. It is an article well deserving, from its many virtues, to be called "*the poor man's friend*," as there is scarcely a disease that a person can be troubled with in which the chocolate root cannot be used with profit to the patient. It grows in moist meadow lands, and is generally known, even by children, as they are taught from their infancy to be familiar with its medicinal virtues.

A teaspoonful of the powder may be put into half a teacup of water and sweetened, with the addition of a little milk, in which form it may be taken either as an article of diet or as medicine. It may be used by those troubled with sore mouth or dysentery in the root in its green state, by masticating and swallowing the saliva and the root in the fine substance; or it may be made into a syrup, by putting one pound of the green root, well bruised, into one gallon of water, and simmering it down to three

quarts; then strain off, sweeten well with loaf sugar, add four ounces of allspice, well pulverized, one quart of 4th proof Jamaica rum, and one teaspoonful of Cayenne pepper.

The syrup should be made in the fall or spring, before the leaves have come out or after they have decayed, as the root then possesses its full strength. The medicine should be carefully stopped in a jug, and kept constantly on hand for use, but especially in the spring, summer and autumn, when we are liable to be attacked with dysentery, chronic diarrhœa, dyspepsia, &c.

GERANIUM MACULATUM—No. 3, continued.

Cranesbill.

ASTRINGENT, TONIC, AND BITTER.

For canker, dysentery, and to cleanse the stomach and bowels.

Geranium Maculatum. *Folia—Radix.* The leaves and root—Erect, pubescent, reversed. *Stem*, dichotomous. *Leaves*, opposite, three or five parted, upper ones sessile. *Peduncles*, two-flowered. *Petals*, obovate.

The *cranesbill* has a perennial, fleshy root, which sends up annually an erect, herbaceous stem, with a number of radical leaves. The stem is round, branched, from twelve to twenty inches high, of a light green color, and thickly covered with petioles and peduncles, which are hirsute. The division of the leaves is into several lobes, which are incised and hairy, and of a light green color, and scattered with still paler spots. The leaves which rise from the root are attached by foot-stalks, six or eight inches long. The flowers are usually large and purple. The peduncles spring from the angle of the stalk and stem; and severally support two flowers.

The cranesbill is indigenous to all parts of the United States, in woods, meadows and hedges, but most usually in moist low grounds. It flowers in June and July. The roots should be gathered in the fall.

Medical uses.—This species of geranium is one of the most powerful astringents with which we are acquainted, and may be employed for all the purposes that any of the articles under No. 3 are used. The absence of a bad taste, renders it very serviceable in cases of infants, or persons of weak and debilitated stomachs. It is an excellent article for cholera-infantum in its last stages, and for diarrhœa. For hemorrhage of the lungs and bowels it is very useful. Care should be taken that the condition of the system be such as not to require the use of powerful astringents. As an application to torpid ulcers, and an in-

jection in gleets and leucorrhœa, or whites; a gargle in aphthous ulcerations, or putrid sore throat, it answers as valuable a purpose as the other astringents—bayberry, witch-hazle, red raspberry, &c. It is considered as a valuable remedy in many parts of the country, and much used by all Thomsonians who are acquainted with its virtues.

For a dose, take a teaspoonful of the fine powder in a teacupful of hot water, to which add a little Cayenne, and sweeten, with milk. It may be used instead of composition, or any of the canker remedies, while under the operation of courses of medicine.

It may be simmered with honey and borax, and used for all inflammatory difficulties of the mouth and throat. It is good for old ulcers, which may be washed in a decoction of the roots. It is an excellent article to sweeten the mouth and breath, and to cleanse the teeth from impurities, by its rough cleansing properties.

Children that are teething, by taking a weak beverage made of this root, sweetened, and with milk, will remain healthy in the stomach and bowels.

QUERCUS RUBRA.—No. 3, continued.

Black Oak.

BITTER, ASTRINGENT, SLIGHTLY STIMULANT, TONIC, AND AROMATIC.

For dysentery, hemorrhage, intermittents, and obstinate diarrhœa.

QUERCUS RUBRA. *Cortex—Glans iberica.* The bark and acorns.—*Leaves*, long-petioled, oblong, glabrous, obtusely sinuate, lobes acutish, toothed, setaceous-mucronate. *Calyx*, saucer-form, smoothish. *Acorns*, sub-ovate, turgid.

This valuable tree is indigenous to the United States, and is one of the largest of the American forest. It frequently attains the height of from seventy to one hundred feet. Its trunk is covered with a thick bark, of a dark brown color. The acorns are round, flattened at the top, and placed in a saucer-shaped cup.

The bark of black oak is the most powerful bitter of any of the species, and may be distinguished by its coloring the saliva when chewed.

Medical uses.—The bark of the oak is an astringent and feeble tonic, and may be used in fever, obstinate diarrhœa, and scrofula. It may be compounded with bayberry, hemlock, witch-hazle or raspberry, in the proportion of one fourth, and used in all cases of canker, or for any of the purposes for which

any article of No. 3 may be used; or as one of the ingredients of composition powders.

The acorns, when ripe, may be pulverized and simmered in honey, with a little Cayenne or ginger, and used for sore mouth, or inflammatory sore throat, and is also good for children that are troubled with looseness of the bowels.

The *White Oak* (*quercus alba*) possesses nearly the same properties as the *quercus rubra.* The bark of both is valuable as medicine, and should be gathered, dried, and pulverized for use, the same as other articles of the kind. The acorns may be gathered, when ripe, and prepared the same as the bark.

SALVA OFFICINALIS.—No. 3, continued.

Sage.

TONIC, ASTRINGENT, AROMATIC, AND STIMULANT.

To ease arterial and nervous excitement, and quiet the mental faculties.

SALVA OFFICINALIS. *Seminæ—Capsules—Folia—Caulis.* The seeds, whorls, leaves, and stalks.—*Calyx*, sub-campanulate, striate, and two-lipped, above three-toothed, below bifid. *Corolla*, tube widening at the faux, limb bilabiate, the upper lip arched and emarginate, the lower, three-lobed, the lateral segments narrower, the intermediate one larger and nearly round (sometimes crenate). The two fertile filaments transeversely pedicellate.

Sage is a perennial garden plant, from twelve to twenty inches high; its flowering summit and leaves have a strong, fragrant odor, and a warm, bitter, aromatic, and somewhat astringent taste. It possesses a volatile oil which may be procured by distillation with water, and contains considerable camphor.

Medical Uses.—There are combined in sage a considerable degree of tonic and astringent powers, which are common to most aromatic plants. In form of a gargle, when combined with alum or borax, in vinegar, with cayenne and honey, it is an excellent remedy for inflammation of the throat and relaxation of the uvula. In the Thomsonian practice, sage in connection with senna, has been used with good results. While the writer was in practice on the island of Nantucket, in 1822, the typhus fever was epidemic during the winter, and proved fatal to the greater part of those who were attended by the regular physicians. One family in particular, lost three of its members, all of whom were under a high state of mental derangement, from the first or second day after the attack. The

symptoms were pain in the head, back and limbs, with sore throat, and great anxiety and nervous excitability. The first lived seven days, the second four, and the third eleven. The unremitted attention of two or three physicians, could afford no relief. After the decease ot the last child, the father remarked, that should another member of his family be attacked, he should employ the botanic physician. In a few days, the eldest daughter was taken with precisely the same symptoms as the others, and much against her inclination, we were called. As it was highly important for the safety of the patient that she should possess her mental faculties during her sickness, in order that we might know from herself the situation of her system, and as she was already inclining to derangement, our first object was to quiet the nervous irritability of the body, and relieve the distress in the head. To effect which, we took half an ounce of sage, half an ounce of senna, (cassia marilandica) and put the two articles into half a pint of boiling water, to which we added one teaspoonful of ginger. The articles were simmered together about twenty minutes; then half the quantity was poured off and administered at a time, when cool enough to drink. We also applied to the neck an adhesive stimulating plaster, and put a bottle of hot water to the feet. The medicine operated, and in about three hours, the pain in the head was entirely gone, the nervous excitement was much reduced, and the patient felt quite comfortable. Tonics were next given, and in a few days she was restored to health without at any time losing her senses. The same winter we attended five patients in that family, three of the typhus fever, and the case above mentioned is a fair account of the others. They all recovered to the great satisfaction of their parents. I occasionally gave a light emetic, and sometimes ordered an injection of milk, in which were cayenne and castor oil: this would entirely remove the stricture of the bowels. Cathartics and astringents were given in such proportions as to produce just a healthy motion of the bowels, consequently the head was clear, easy and comfortable. When these two opposite medicines were given, in just proportions to correct the action, I found no danger of mortification, or of any other injury resulting from the physic.

In putrid difficulties, sage tea may be used with great advantage, as an antiseptic; and if an aperient were to be used, it should be of oil and milk. This creates an agreeable sensation, and renders the patient comfortable. In all cases of violent diseases, attended with insanity, the bowels are generally the seat of the disease, attended with cold feet and a pressure of blood to the head. In such cases, after using the proper remedies for the bowels as laxatives, bathe the feet in hot water, and

Chelone glabra.

Balmony. Snake head.

thus you will much assist the favorable operation of the medicine. Powerful physic should never be given.

BITTERS TO CORRECT THE BILE AND RESTORE DIGESTION.

CHELONE GLABRA.—No. 4.

Balmony—Snake-Head—Bitter Herb.

STOMACHIC, BITTER TONIC,

To correct the bile, and assist the digestive powers.

CHELONE GLABRA. *Flores—Folia.* The flowers and the leaves.—The *leaves* opposite, lance-oblong, acuminate, serrate. *Spikes*, terminal, dense-flowered; flowers purplish white.

Chelone Alba. Leaves sub-sessile, flowers white.

Chelone Purpurea. Leaves short-petioled, flowers purple.

Chelone Lanceolate. Leaves lanceolate, acuminate, serrate, sessile, pubescent beneath: segments of the calyx, oblong.

These different species of the same order possess nearly the same medical properties. The chelone glabra grows most abundantly in wet mowing lands, or by the side of brooks or rivulets. It is about the size of spearmint, and resembles it in height and in the shape of the stalk and leaves. The leaves are dark green, and of a sweetish bitter taste. The white flower is of a singular form, resembling a snake's head, with the mouth open—hence its name.

Medical uses.—The balmony is a bitter of the first order, for correcting the morbid secretions of the bile, removing the torpidity of the liver, and creating an appetite. A tea made of the plant may be used alone, or with any of the articles under the head of No. 4; all of which are calculated to restore the digestive powers.

HYDRASTIS CANADENSIS.—No. 4, continued.

Golden Seal—Kercuma—Orange Yellow, or Turmerick Root.

TONIC, STIMULANT, BITTER AND ASTRINGENT.

To restore digestion, and correct the morbid state of the liver.

HYDRASTIS CANADENSIS. *Radix.* The root.—*Stem*, with two opposite leaves above. *Leaves*, petioled, emarginate at the

base, palmate, serrate, gashed. *Peduncle*, terminal, solitary, one-flowered. *Root*, yellow.

Golden Seal is an herbaceous, annual, and indiginous plant, growing in different parts of the United States, but mostly west of the Alleghany mountains. It flourishes best in wet wood lands. It has a perennial root, and an herbaceous, annual stem, from six inches to one foot in height, with two unequal leaves, and a single terminal whitish or rose-colored flower. The root consists of a tortuous cordex, and numerous long fibres, and is of a bright yellow color. It is juicy when newly dug, and its weight is much diminished by drying. It has a strong odor, and an exceedingly bitter taste. It possesses the ordinary virtues of vegetable bitters in a great degree, and is popularly employed as a useful tonic by Thomsonian physicians throughout the United States. In form of an infusion, it has been much used in the western states, as a topical application in ophthalmia (inflammation of the eyes). The Indians are said to have employed it in the same form for old sores. They also use the juice of the root as paint and for coloring.

Medical uses.—For dyspeptics, or those who are troubled with indigestion, a teaspoonful of this root pulverized, taken in a little hot water, sweetened, with the addition of a little Cayenne, will give immediate relief from the distress caused by food in the stomach. It is an excellent corrector of the bile, and may be used for that purpose. Compounded with poplar bark, one part of golden seal and two of poplar bark, four parts of good sugar and one eighth part Cayenne, forms a compound that is valuable in every family, where it should be used. When the food occasions distress, a small particle of this powder—the size of a pea—will remove the inquietude. It is also good in cases of worms in children, taken in hot water. It is very good in jaundice, and in all derangements of the digestive organs. In colic, it may be used to good effect. If you have a faint sickening sensation at the stomach and no appetite, take a little of this in hot water, sweet wine, or cider. In fact, if you wish a remedy which you can find the most extensively useful in the little every day ills to which we all are liable, keep a supply of this medicine on hand.

Populus tremuloides.

White poplar. American aspen

POPULUS.—No. 4, continued.

American Aspen—Poplar Tree.

TONIC, AROMATIC, BITTER, APERIENT.

To restore the gall, and digestive powers.

POPLAR.—*Cortex.* The bark.

There are eight different species of the poplar, all of which are used as medicine, but some of which are more valuable than the others.

Populus tremuloids, white poplar, or American aspen. The *leaves* are heart-roundish, abruptly acuminate, tooth-serrulate, glabrous, a little pubescent at the margin, with two glands at the base on the upper side. *Petioles*, compressed, in the young stalk, silky. This species is much used by Thomsonians.

Populus glandidentata (tree poplar). *Leaves*, round-ovate, acute unequally, and coarsely sinuate, toothed, glabrous; in the young state villose. *Petioles*, compressed.

Populus pendula varies from the last species by the branches being pendulous, or sagging heavily down.

Populus betulifolia (birch leaf poplar). *Leaves*, rhomboidal, long-acuminate, dentate, glabrous; young branches pilose.

Populus angulata (balm of Gilead, water-poplar, or cottonwood). *Leaves*, ovate-deltoid, acuminate, obtusely hook-toothed, glabrous, younger ones broad-cordate; branches, wing-angled.

Medical uses.—The *Balm of Gilead* is much used by many of the Thomsonian practitioners, in a preparation for a cough, or by making a balsam of the pulverized buds. We have used it as follows, compounded with honey, the syrup of ginger, with a syrup made of sugar, or of any kind of preserves, such as peaches, pine apples, raspberry, blackberry, quince, plums, or with the syrup of apple sauce, well saturated. Put two ounces of the buds, made fine, into one pint of either kind of the syrups above mentioned, and simmer it over a slow fire from fifteen to thirty minutes, and when cold add a gill of 4th proof Jamaica rum, and stop it tight in a bottle with the grains for use. It is good for coughs, pain in the side, shortness of breath, spitting blood, and in many cases its tonic powers operate well on the appetite.

In many cases the balsam will be too strong a tonic for weak patients; in such cases it must be reduced, by taking a few drops, in soft water, warm. In ordinary cases it may be taken from half to a teaspoonful. In a great variety of other ways this valuable balsam may be taken.

Populus balsamifera (balsam poplar, black poplar, tag pop-

lar, stinking poplar). *Leaves*, ovate acuminate, with close-pressed serratures, white and net-veined beneath; bud resinous. This is the most valuable species of all the poplars for its own tonic properties. The bark may be dried and pulverized for use; or it may be boiled down, and an extract procured, which is one of the most valuable articles in the way of tonics or bitters of any in the Thomsonian materia medica.

Medical uses.—The pulverized bark may be used in the composition powders to good advantage. Take one pound of this bark, or more if you wish to make it bitter, and add it to the composition, as prepared. (See preparations.)

It may also be used in proportion of three pounds to one of golden seal, two ounces of Cayenne, and eight pounds of sugar, all well mixed. This compound is an excellent article for dyspepsia, and all cases of indigestion. It may be taken dry, in milk, in warm water, and in various other ways; but the best manner is the most simple, that is, dry or in warm water, with milk and sugar. Dose, from half to a teaspoonful.

For the aged and infirm, where the vital energy is fast declining, and nature needs the assistance of a medicine that will support it, the same as a staff does the body, this article will serve for that purpose, so long as the digestive powers can be braced up to support the body.

When a person has arrived at maturity, the digestive powers have attained their highest state of strength or perfection. But they now begin gradually to decay. The person may eat the same amount of food as formerly, but there is not the same ability to extract by digestion the same quantity of nourishment. As digestion continues gradually failing, so do the other constitutional and mental powers follow, the same as they did in arriving at maturity, and the strength and substance of the body which were accumulated in youth, are drawn upon to support the system. When the digestive powers begin to decay, we are admonished to do something to sustain the body under its consequent dibility. Two different methods are adopted. One is to support the body by means of a staff, the other to brace up the digestive organs by means of internal applications.

By these two methods combined, if the constitution has sustained no material injury, the person may live and make himself comfortable to a great age. Take good care, therefore, to keep the gall strong and healthy, by a good artificial bitter, as that is the physic of the body, and without which the system is soon filled up or obstructed, from a costive habit, the appetite impaired, and the body can procure but little nourishment from the food. Assist the natural stimulus by artificial means, as its natural means of production fail, which is the proper consumption of food, or the *fuel* of life. Thus keep up the *power*, or

Populus angulata.

Balm of gilead.

a head of *steam*, or *vitality*, if you so please to call it, to operate upon the machinery.

It is absolutely necessary that every person should become something of an engineer, in order to work systematically and philosophically, his own mortal powers, in such form and manner as to enjoy in the greatest possible degree the blessings of life, the pleasures of society, and the beauties and grandeur of the celestial as well as terrestrial works of creation.

An extract is made from this bark, that is very useful in the form of pills. It is also used, for its adhesive properties, in making emetic and other compound pills, used in our practice.

BERBERIS VULGARIS.—No. 4, continued.

Barberry.

REFRIGERENT, ASTRINGENT, ANTISCORBUTIC AND APERIENT.

To restore digestion, and correct the morbid secretions of the blood and bile.

BERBERIS VULGARIS. *Bacca—Cortex—Radix.* The berries, bark, and root.—*Branches*, punctate. *Prickles*, mostly in threes. *Leaves*, obovate. *Flowers*, racemed.

This bush is from four to ten feet high, and grows wild in the United States, and in many parts of Europe, and is frequently cultivated for its berries, which grow in loose clusters, are oblong, and of a red color, have a pleasant sour and rather an astringent taste, and contain malic and citric acids. It is antiscorbutic, astringent and refrigerent, and is frequently used in the form of drink, in febrile diseases and diarrhœas. A pleasant drink is made from the juice, and the berries are frequently preserved for the table. The bark has been used for dyeing yellow, and also much employed in treating the jaundice. The bark owes its coloring property to a peculiar crystalizable principle, which has been denominated *berberin*, and which is said to the dose of from one fourth to a teaspoonful, or from three to ten grains, to act as a tonic and a purgative.

Experienced farmers inform us, that *wheat* will not flourish successfully within forty or fifty rods of where this bush grows. The filaments of this shrub have a remarkable degree of irritability; for on being touched near the base with the point of a pin, a sudden contraction is produced, which may be repeated several times.

Medical uses.—The berries, which are pleasantly acid, and moderately astringent, are of use in biliary fluxes, and in most cases where acrimony, heat and putridity of the humors predominate. The syrup of the fruit preserved makes a pleasant re-

frigerating drink for patients who are laboring under inflammatory fevers, and the berries when thus preserved make a rare delicacy for the table, and are useful to sharpen the appetite.

The bark of either the body or root is a pungent bitter, and a useful medicine to correct the gall, regulate the digestive powers, and remove a costive habit. The bark should be collected at the proper season, carefully dried and pulverized, and may be used as a part of No. 4 bitters.

The finely pulverized powder is a cathartic, in teaspoonful doses, at night on going to bed. The bark of this shrub is sometimes used in cider for the jaundice, and is next in value to golden seal and poplar.

APOCYNUM ANDROSÆMIFOLIUM.—No. 4, continued.

Bitter Root—Wandering Milk-Weed—or Dog's Bane of the Highlands.

EMETIC, CATHARTIC, NARCOTIC, HYDRAGOGUE.

To remove costiveness, and correct the digestion.

A. ANDROSÆMIFOLIUM. *Radix.* The root.—*Calyx*, very small, five-cleft, persistent. *Corolla*, companulate, half five-cleft. *Lobes*, revolute, furnished at the base with five dentoid glands, alternating with the stamens. *Anthers*, connivant, sagitate, cohering to the stigma by the middle. *Style*, obsolete. *Stigma*, thick and acute. *Follicles*, long and linear. *Seeds*, connose.

The *dog bane* or *bitter root* is an indigenous, perennial plant, from one to three feet in height, and abounding in a milky and extremely bitter juice, which exudes from all parts of the plant when wounded. The stem is very straight and erect, smooth below, much branched above, usually of a reddish color on the side which is exposed to the sun. The plant is covered with a very tough bark. The leaves are opposite, ovate, entire, acute and smooth on both sides, and nearly three inches in length. The flowers are reddish white, and grow in loose, axillary, or terminal cymes. The peduncles have small acute bracts. The corolla has a tube longer than the calyx, and a spreading border. The fruit consists of a set of long, acute, linear follicles, containing many imbricated seeds, which are attached to a receptacle in the centre, and each furnished with seed-down.

The plant grows in all parts of the United States. It is found in grain fields, and grows very luxuriously among shrubs and vines, by the side of fences, and where the ground is most neg-

lected. It flowers in June and July. The bark of the root is the part used as medicine. This is large, and like other parts of the plant contains a milky juice. Its taste is unpleasant and intensely bitter. The pulverized root is very white.

Medical uses.—The powder of the newly dried root acts as a sternutatory when taken as snuff, and as an emetic, in doses of from half to a teaspoonful, or more. In small quantities, sufficient to nauseate the stomach, the powders are an excellent remedy for lues veneria, syphilis or venereal. The root should be dug in the fall, the bark bruised off and carefully dried, after which it should be pulverized. It is one of the greatest correctors of the bile that is used in our system of practice, except the golden seal and black poplar. For regulating the bowels and removing a costive state, its operations are admirable. It may be used in small quantities for the dropsy, as it is a powerful hydragogue, cathartic, emetic and diuretic. I have known a dropsical patient, from the use of this article to discharge several quarts of water in one night. It is also a sudorific, as it causes copious perspiration.

Take of the pulverized bark of the root, one ounce, three fourths of an ounce of witch-hazel leaves, and one fourth of an ounce of bayberry, all made very fine; mix, and they make a powerful snuff, for catarrh, and other difficulties of the head. This snuff is frequently used by us in the last stages of acute diseases with small children. If there is vital energy sufficient left for the child to sneeze, we conclude there is yet hope for the little patient. This is the best way to test the immediate vital action, in those extreme cases, that has as yet been discovered by us. No injury can arise from a trial of this means.

APOCYNUM CANABINUM.—No. 4, continued.

***Bitter Root*, *or* *Wandering Milk-Weed*, *or* *Dog Bane of the River lands*.**

Properties and application—the same as the preceding article.

In its character, this plant resembles that which we last described; and also in most of its operations upon the system. We have gathered the two indiscriminately, compounded them together, and dealt them out as one and the same thing.

Take three doses, of one third of a teaspoonful each, of the powder, in a little hot water, once in two or three hours, and it will operate as a cathartic in about twelve hours. Care should be taken that the quantity be not too large, as the operation as an emetic and cathartic is exceedingly powerful in such cases. We have known it to operate as an emetic for eight hours in succession, before it could be stopped.

ALETRIS FERINOSA.—No. 4, continued.

Unicorn Root—False Aloe—Stargrass—Starwort, &c.

TONIC, BITTER, EXPECTORANT, AND SLIGHTLY EMETIC, AND CATHARTIC.

For pain in the side or breast, cough, and torpid liver.

ALETRIS FERINOSA.—*Leaves*, linear, lanceolate, withering at the tips. *Scape*, with alternate, pedicelled, mostly farinaceous flowers. The root extremely bitter.

This plant is found in almost all parts of the country, growing in open fields, and about borders of pine forests, and blossoms in June and July.

Medical uses.—The *unicorn root* is a valuable tonic, and may be usefully employed for similar purposes with other bitters of the same class, for female weaknesses, and pain in the side and breast.

When taken in large quantities, it will create nausea and vomiting, and will frequently operate as a cathartic. The powder may be used in doses of from one fourth to a teaspoonful. In female weakness and nervous debility, this remedy has proved itself one of the first order. In cases of frequent abortion, when the system had lost its tone and had become much debilitated, it has in many instances afforded permanent relief. We have known of females who had been troubled this way, being restored to such a degree of health as to have several children added to the family, and always do well in time of confinement, and enjoy good health afterwards.

The venerable founder of the Thomsonian practice, while in the state of Ohio, a few years since, had the misfortune to fall and break three of his ribs. He was also otherwise seriously injured internally. He remained very feeble for several weeks, having a distressing, irritable, dry cough, and pain in his side, and he could find but temporary relief, until he began to make use of this remedy, which immediately cured his cough, strengthened his sides and lungs, and in a few weeks he found himself enjoying excellent health. From that time he has been in the habit of using it for consumptive patients, with the most happy results.

It is the belief of those who have tried it, that if a person of feeble constitution exposes himself by taking a severe cold, and makes use of half a teaspoonful of this powder, in a little hot water, sweetened, he will receive no injury from his exposure. And for uterine difficulties it has not its equal to our knowledge within the range of the Thomsonian materia medica.

It may be used alone in warm water, in the composition, in wine bitters, in the No. 6. Or it may be made into a syrup;

and the weakly female who makes a trial of this remedy, as directed to be compounded, will in it find her reward.

CORNUS FLORIDA.—No. 4, continued.

Boxwood—Dogwood.

ASTRINGNT, TONIC, EMMENAGOGUE.

To correct a morbid state of the stomach, and remove female weaknesses.

CORNUS FLORIDA. *Flores—Cortex.* The flowers and bark. —This small tree is indigenous, and usually from ten to twenty feet high, though sometimes more. The stem generally attains a diameter of four or six inches, and is covered with a brownish bark. The spreading branches are regularly disposed, sometimes in fours, nearly in the form of crosses, and at other times opposite. The leaves are oval, pointed, dark green, and about three inches long, sulcated on the upper surface, whitish beneath, and marked with parallel veins. The latter part of the summer, they are marked, or speckled, with black spots, and in cold weather the leaves assume a reddish color. The flowers are small, yellowish white, and collected in heads of four white, obcordate leaves, notched at their summit, and tinged with red or purple. This involucre constitutes its chief beauty, and the flowers contain most of its medical virtues.

The *dogwood* is found in all parts of the Union, but is most abundant in the middle states. In May it is clothed with a profusion of large white blossoms, which render it one of the most conspicuous ornaments of the American forest. The bark is an astringent medicine, and is good for intermittents. The flowers are bitter, and are the part generally employed as Thomsonian medicine.

Medical uses.—The Cornus Florida is tonic, astringent, and a corrector of the bile. When taken internally, in sufficient quantities, it augments the frequency and strength of the pulse, and increases animal warmth. The properties of this article closely resemble those of the Peruvian bark, for which it is frequently substituted in intermittent fevers.

The flowers are used by Thomsonian practitioners in leucorrhœa, whites, or fluor albus, to great advantage. In a number of cases of young married females, which have come under our notice and treatment, who have been troubled with fluor albus so severely that they were dragging out a miserable existence, and to their mortification had no family, in consequence of the weak state of the system, we have used this article with good success.

COPTIS TRIFOLIA.--No. 4, continued.

Goldthread.

TONIC, AND POWERFULLY ASTRINGENT.

For correcting morbid secretions, of a torpid liver and bile.

Coptis Trifolia. *Radix.* The root.—*Scape*, one-flowered. *Leaves*, tenate, two or three inches long. *Roots*, filiform, golden yellow.

Goldthread bears considerable resemblance to the white strawberry vine. It has a creeping, perennial root, of a bright yellow color, from which it derives its name. The goldthread is a native of the northern states. It grows in morasses, and cold, northern regions, and abounds in the British provinces, and in the hilly districts of New-England. It blossoms in May or June. The plant possesses great bitterness, but the root is the only part used by us as a medicine.

Medical uses. The *coptis* is an excellent bitter, closely resembling golden-seal and barberry, and may be used in all cases where those articles have been recommended. In the eastern states it is much used for apthous ulcerations, and is an excellent substitute for the bitters before mentioned, as it is a great corrector of the gall. It is an excellent gargle for sore mouth and throat. Every Thomsonian physician should keep a supply for use.

MARUBIUM VULGARE.—No. 4, continued.

Horehound.

BITTER, TONIC, APERIENT, EXPECTORANT.

For coughs, asthma, and bleeding or weakness of the lungs.

Marubium Vulgare. *Herba.* The herb.—Horehound has a fibrous, perennial root, and several annual stems, which are erect, very downy, and from ten to sixteen inches high.

This plant is a native of both Europe and America. In this country it grows spontaneously, along road-sides and in neglected fields. It flowers in July and August. The herb has a strong bitter taste, and rather an agreeable odor, which is much reduced by drying, and is nearly lost by being long kept. Its bitter taste is durable, and may be extracted by water or alcohol.

Medical uses.—Horehound is a tonic and laxative, and may be given in such forms and quantities as to increase the excretions in the skin and kidneys. It is a valuable deobstruent, to remove obstructions, and is good in inflammation of the liver, jaundice, menstrual obstructions, phthysis, or consumption of the lungs, &c.

A tea made of the herb and sweetened with honey is a valuable remedy for asthma, and other complaints of the lungs. It is an expectorant and stimulant. A syrup made of the herb will remove heaviness, and detach from the mucous membrane the tough cohesive phlegm, so difficult to eject from the lungs, and which reduces consumptive patients so rapidly. Candy made with horehound is an excellent article for people who have become hoarse, from whatever cause, or for those whose vital heat is so much reduced that the saliva, instead of retaining its natural consistency—nearly that of warm water—has become thick and adhesive.

SYMPHYTUM OFFICINALE.—No. 4, continued.

Comfrey.

SLIGHTLY ASTRINGENT, TONIC, AND BITTER.

For female complaints, and weakness of the back and stomach.

Symphytum Officinale.—*Radix.* The root.

Comfrey is a perennial, exotic plant, cultivated in gardens for medical use. Its root, which is spindle-shaped, branches, and is frequently more than an inch thick, and ten or twelve long. It is smooth and blackish; white, fleshy and juicy within. It becomes wrinkled by drying, and of a firm, horny texture, and turns dark within. It has a mucilaginous, inodorous, and slightly bitter taste. Among its qualities are mucilage in abundance, and a little tannin. It is highly esteemed as a remedy for female weaknesses, for which it has but few equals. Its virtues are chiefly those of a stimulant, and it may be used as a substitute for marsh-mallows. In many cough mixtures it is one of the principal ingredients, and is much employed in pectoral affections, such as catarrh and consumption. It may be used in tea, made of the fresh or dried roots. This root yields a larger proportion of mucilage to water than the mallows.

Medical uses.—Comfrey roots, after having been boiled soft, may be eaten with a very beneficial effect, by females who are troubled with the fluor albus. They are not only a valuable medicine, but are nearly as esculent as the potatoe. The tea, sweetened, is a good article for a weak or lame back.

Comfrey syrup.—Take a large handful of the roots, well cleansed, boil them twenty or thirty minutes in two quarts of soft water, pour off the liquor, pulverize the roots, and work them through a fine sieve into the liquor, sweeten well with loaf sugar, grate in four nutmegs, beat up four eggs and stir in when the syrup is cold; then add two quarts of best Madeira

wine, and preserve; let it be shaken when used. Dose, from a fourth to half a glass, from four to six times a day.

This is one of the best syrups for weakly females I ever prepared. It is good for all cases of debility or consumption, and only needs a fair trial to establish its virtues.

To Restore the Digestive Powers, and give Tone to the Stomach and Bowels.

AMYGDALUS PERSICA.—No. 5.

Peach Tree.

ANTHELMIC, CATHARTIC, TONIC, AND STOMACHIC.

To restore digestion and regulate the stomach and bowels.

Amygdalus Persica.—*Fructus—Nuclei—Folia—Flores Cortex.* The fruit, kernels, leaves, flowers and bark.—Serratures of the leaves all acute. *Flowers*, sessile, solitary, exotic.

Most of us are well acquainted with the appearance of the common peach tree. Its characteristics are, its sessile, solitary flower, and all the serratures of the leaves acute. Its native country is not certainly known, but it is generally supposed to have come from Persia. Probably in no other country it attains as great perfection in the quality of its fruit as in the United States. Among our summer fruits, peaches may justly be ranked as one of the first, for their grateful flavor and wholesome qualities. The peach abounds in saccharine matter, that renders the juice liable to fermentation, the same as vinous liquors. A liquor is distilled from them, called peach brandy, which is much used in the western states. The nut of the fruit contains a kernel, that much resembles, in appearance, properties and nature, the bitter almond, for which they are, in the Thomsonian practice, substituted. The leaves, flowers, and bark, also, have the odor and taste of the bitter almond, from which a volatile oil may be distilled. The flowers, kernel, bark and leaves, are used in our practice.

Medical uses.—The flowers and leaves are laxative, and a syrup made of them is good for indigestion and costiveness. Take one ounce of the flowers and steep them in a quart of water down to a pint and a half, sweeten it well with loaf sugar, add half a pint of 4th proof Jamaica rum, and stop it close in a bottle for use. If more strength is required, the leaves and ker-

nels may be bruised and infused with the flowers. Or, if the flowers are not to be had, the leaves, bark and kernels, or either of them, may be prepared alone.

This is one of the best anthelmintics, or remedies for worms or disordered bowels in children, that can be prepared. It is also good for children when teething. And the same remedies that are good for children, are good for adults in the same complaints.

Dose, from half to a wine-glass full for an adult, and for children a table spoonful—to be taken two or three times a day, before eating. Each family, if possible, should have a supply of this medicine.

The leaves, used in decoction, are a gentle aperient, or laxative, and are a great regulator of the digestive powers and costive habits. It is also a sedative, or in other words it exerts a calm and serene influence throughout the system, and is calculated to ease pain in the stomach and bowels.

An extract, of a dark resinous color, may be made from the leaves or bark, that is much used as an aperient, in the form of pills, and may be usefully employed, on account of its adhesive properties, in compounding pills.

An infusion of the leaves is good for irritability of the bladder, *vesica urinaria*, sickness at the stomach, and whooping cough, or *pertussis*. In this case, if the syrup does not afford relief, give from half to a pint, in the course of a day, of the strong infusion of the leaves, in small doses.

The dried fruit, stewed in sugar, is an excellent article of diet, suitable for persons in almost any situation of health, and more especially those troubled with costiveness.

The ripe fresh peach is the most healthy article of fruit to be found in this country, and may be extensively used with safety by any person who is fond of it, and more especially those who are diseased, as it has been recommended by us to numerous patients who have labored under various forms of disease, and who have used it freely without any injury. Children may eat them freely; and their anthelmic, or worm correcting properties, cause them to receive no injury. If freely used by children, they will seldom be troubled with disordered or costive bowels.

We are fully satisfied that the *amygdalus Persica*, or peach tree, is one of the most extensively useful trees in the United States; and its fruit is not equalled by that of any other, for its nourishing and correcting medical properties. In fact, the the peach tree would furnish almost a universal catholicon, so numerous are the ways in which its virtues may benefit the human family. Persons of seventy years of age, who have always been accustomed to the use of the different productions of

this tree, inform us that they never knew any injury to result from its use. This we consider conclusive evidence of its many virtues.

PRUNUS VIRGINIANA.—No. 5, continued.

Black Cherry—Wild, Rum, or Cabinet Cherry.

TONIC, AROMATIC, ASTRINGENT, AND SLIGHTLY STIMULANT.

To correct digestion, and restore tone to the stomach and bowels.

PRUNUS VIRGINIANA. *Baccæ—Cortex.* The berries and bark.—*Racemes*, erect, elongated. *Leaves*, oval-oblong, acuminate, unequally double-toothed, glabrous both sides. *Petioles*, generally bearing four glands.

In open fields, the limbs of this tree spread out into an elegant oval top; but in dense forests, it grows to a very great height, with a few contracted branches. The flowers are small, white, and collected in long erect racemes. They appear in May, and are followed by globular drupes, about the size of a pea, and when ripe, of a shining blackish-purple color.

The *wild cherry* is one of the largest trees of the American forest; sometimes growing, on the banks of large rivers in the west, from seventy to upwards of one hundred feet high; with a trunk, from fifteen to twenty feet in circumference. But this tree in the eastern states, is of much less dimensions. In open grounds it is not so large as in the forest, but is more branched, often appearing with an elegant conical summit. The trunk is very regular in its shape and is covered with a black, rough bark, which is easily detached in thick narrow strips, and thus the tree may be distinguished, when the leaves are too high for inspection.

This species of cherry abounds in all parts of the United States, but flourishes best in a rich soil and temperate climate. It is much valued for its wood, which is fine grained, compact, and susceptible of a high polish, is of a redish tint, which deepens with age. The fruit has a bitter, tonic, sweetish, and astringent taste; and is sometimes used to give a flavor to spirituous liquors. The inner bark divested of the epidermis or cuticle, is the part used as medicine, and may be obtained from any part of the tree, but that from the roots is the best. The bark should be used when fresh from the tree, as it possesses more of the essential oil when green.

Properties.—Wild cherry bark in the fresh state or when boiled in water, emits an odor resembling that of peach leaves. Its taste is agreeably bitter and aromatic, with the peculiar fla-

vor of the bitter almond. It imparts its sensible properties to water, either cold or hot, producing a clear reddish infusion, resembling Madeira wine in appearance. Its flavor, as well as medical virtues are much injured by boiling, in consequence, partly, of the volatilization of the principle upon which they depend; and partly upon a chemical change, effected by the heat. An oil can be extracted from the fruit, leaves or bark, of a light straw color, volatile in its nature, and very closely resembling in its properties, the volatile oil of bitter almonds.

Medical Uses.—The bark of the black cherry tree is one of the most valuable tonics among our indigenous remedies. It has also the power of calming irritation, and diminishing nervous excitability; and is admirably adapted to the treatment of diseases in which a debilitated state of the stomach, or of the system at large, is united with local or general irritation. When taken in large quantities, it is said to diminish, perceptibly, the action of the heart. If the cold infusion be taken in large draughts daily for several days, it will reduce the pulsation about one third. This remedy is highly useful in consumptive complaints, scrofula and jaundice. In general debility, it has also been found advantageous; and is well adapted to cases of dyspepsia. It has been usefully applied in intermittent fever. It may be used in powder or infusion made with cold water. The cherries may be dried and kept for use.

Black cherries may be used in the following manner: Take one pound of cherries in their natural state, well pulverized, a half pound of black poplar bark—let the bark be boiled in one gallon of water, strain, and sweeten it with loaf sugar; grate in two nutmegs, and add one quart of Jamaica rum, fourth proof; when cold stir in the cherries and put the contents into a jug, and then add two ounces of pulverized gum myrrh. Shake it well every day for a week and it is fit for use. Dose, from a fourth to half a wine glass, before eating. It is an excellent tonic, and may be used in all cases of indigestion. Good for children in teething or bowel complaints; regulate your dose according to their age.

Again.—The pulverized cherries may be put into cold water and sweetened: or put half a pound of cherries into warm water and add some scorched Indian meal, and a little yeast. This makes a delicious beer to be used in hot weather. It must be kept in a cool place to prevent its souring.

AMYGDALUS AMARA.—No. 5, continued.

Bitter Almond.

BITTER, ASTRINGENT.

Compounded to correct digestion, and strengthen the stomach and bowels.

AMYGDALUS AMARA.—*Nuclea.* The kernel.

The *Almond tree* is from fifteen to twenty-five feet high, and divides into numerous branches. The leaves stand upon footstalks, are about two and a half inches long, and half or three quarters of an inch broad, pointed at both ends, elliptical, minutely serrate, and with the lower serratures glandular, and of a dark green color. The flowers are large, varying in color from red to white. The fruit is of the peach species, with the covering tough, dry, thin, and marked with a longitudinal furrow, where it opens when ripe. The almond is found within this covering, or rough shell.

Medical uses.—Bitter almonds, properly compounded, make an excellent tonic, and may be used for the same purposes as peach pits and cherry stones (see No. 5, syrup). This syrup is prepared as follows: Take poplar bark, and bark of the root of bayberry, of each one pound; boil them in two gallons of water; strain off, and add seven pounds of sugar; then scald and skim, and add half a pound of peach meats, bitter almonds, or black cherry stones, pulverized. When cold, add one gallon of good brandy, and stir it well together. If put into different vessels, let the sediment be proportionally divided amongst it.

This compound is a corrector of digestion, is good to strengthen the stomach and bowels, and restore health to the patients, and is also particularly useful in dysentery and the fluxes. In a relaxed state of the bowels, a tea of No. 3, used night and morning, and this syrup through the day, will generally restore the patient. By using these medicines occasionally, when exposed to dysentery, there is but little danger of taking the disease. It would be well for every family to have this syrup on hand, ready for use, in case of any debility of the stomach and bowels.

To prevent Mortification, and remove Colic, Dysentery and Rheumatism.

BALSAMODENDRON MYRRHA.—No. 6.

Gum Myrrh.

AROMATIC, ASTRINGENT, TONIC, STIMULANT, AND ANTISEPTIC.

To give tone to the stomach and bowels, and prevent mortification.

BALSAMODENDRON MYRRHA.—*Succus concretus.* The juice dried down.

Myrrh, as we learn from history, has been used for medicinal purposes, from the earliest ages of the world. But of the *plant* very little has been known, till within a few years.

Balsamodendron Myrrh is a small stunted tree, with a trunk which is covered with a greyish bark, and furnished with small, shriveled branches, with spines at the termination. The leaves of the tree are obovate, smooth, blunt—obtusely ternate and denticulate leaflets. The fruit is pointed longitudinally, forearmed, of brown color, and at the base is surrounded by persistent calyx. The tree grows in Arabia, in dwarfish thickets. The juice, or sap, exudes by the heat of the sun, and dries upon the bark.

The India and Turkey myrrh are the varieties known in our market. That from India is said to be collected in Abyssinia, while the Turkey myrrh is brought from Arabia and Egypt. When of a good quality, it is of a bright reddish-yellow color, of a strong, peculiar, fragrant odor, and a strong, bitter, aromatic taste. It is very brittle, and presents shining surfaces when broken, which, when in large masses, are irregular. The Turkish myrrh is the best that is imported into this country.

Medical uses.—Myrrh is stimulant and tonic, useful to the lungs, and strengthening to the uterus. It is employed as an emmenagogue to regulate the periodical turns of females, in debilitated states of the system, in the absence of fever. It is given in chronic catarrh, in pulmonary consumption, and other affections where the secretion of mucous is abundant but too morbid to be easily expectorated; in *chlorosis*, or green sickness, *amenorrhœa*, or obstruction of the menses, and the various affections of the uterine functions. It is also used for spongy gums, *aphthous*, or thrush, sore mouth of children, and for unhealthy ulcers.

It may be tinctured in alcohol, brandy, or Jamaica rum, in

the proportion of one pound of myrrh, pulverized, to a gallon of the spirits, and to this add two ounces of Cayenne, and two ounces of prickly ash seeds, and a quarter of an ounce of gum camphor, made fine; put these articles into a jug, and let them be kept gently warm, being occasionally shaken, for two or three days.

These drops are for external application, in such cases as rheumatism, bruises, sprains, and fresh wounds. Internally, for colic, dysentery, pain in the stomach and bowels, and for many other debilitating complaints.

The grains, after the drops have been removed, may be compounded and used in a great variety of ways, and to great advantage. They may be taken and put into a kettle (the amount before mentioned), and add half a gallon of sweet wine; boil them for ten minutes—this will decompose the particles of myrrh; pour off the wine, and add when cool a pint and a half of spirits; sweeten this, and you have an excellent article for a weak stomach, and looseness of the bowels.

This syrup I have known, when given in doses of from one fourth to half a wineglassful, two or three times a day, to produce an appetite when other bitter articles would not. It is also good for diabetes, or continued voiding of urine.

Take two large table spoonsful of the above mentioned grains and put them into wine, sufficient to make the mixture about the consistence of a poultice; boil it two or three minutes, and the myrrh will absorb the wine, and the mass will become of a thick adhesive consistency. Let this be spread upon cloth or leather, and applied to a weak or lame back, a lame side, or weak joints, and the most happy results may be anticipated.

Myrrh is perhaps the most powerful antiseptic known. It has been celebrated for its preserving properties from the earliest ages of the world. The scriptures inform us that myrrh was one of the constituents used in ancient times for embalming the dead; and we have frequently seen specimens of its preservative powers, which have been removed from the catacombs of Egypt, that were supposed to have been embalmed upwards of three thousand years. If such are the preserving powers of myrrh on the dead, what must its effects be on the living?

In 1832, it is well known, that we were scourged with the Asiatic cholera; and one characteristic of the disease was the rapid decay of the solids as well as fluids of the body, passed off by frequent and copious aqueous discharges from the bowels. Such was the rapid consumption of the body, that a fleshy person, in some instances, would be reduced almost to a skeleton, and even unto death, in from twelve to eighteen hours.

On examining the subject, we found that by some means the

atmosphere was surcharged with a foreign substance, that we thought to be nitre, which destroyed in a great measure the oxygen, or vital principle of the air, and at every respiration the patient retained a quantity of this refrigerating or cooling gas, and threw off a proportionate quantity of the oxygen or vital principle, which deficiency was not made up; and by these means the body rapidly lost its stimulus or heat, and received in its stead this refrigerating gas; and as the warmth became reduced at the seat of vitality, that from the extremities was called in, and thus the limbs became cold, contracted and cramped. The secretory vessels were also contracted, and forced back the perspirable matter into the body, which passed rapidly off from the bowels in discharges somewhat resembling rice-water; and at the same time the absence of heat in the extremities caused a contraction of the muscles and violent cramp, until in a short time death usually closed the scene.

In examining the subject I found, as I thought, the first difficulty in the atmosphere, by breathing which the patient could not get that quantity of oxygen that was necessary for a healthy action; consequently, some artificial means must be used to keep up the vital energy, and the rapid consumption of the flesh must be stopped by some preservative article. I therefore prepared the following compound: Pulverized myrrh, two ounces, dissolved in one pint of fourth proof Jamaica rum; to this add a fourth of an ounce of Cayenne, steeped in two or three spoonsful of boiling water; and then to this add half a pint of molasses, and put it into a jug or bottle for use. And in its application my most sanguine expectations were realized. I gave from a fourth to half a glass, according to the circumstances of the case. The necessary warmth was immediately restored to the vitals, and from them it spread to the extremities; perspiration was excited, a healthy action induced throughout the system, and thus the desolating disease was stayed.

Such were the effects of this medicine in Montreal, where I first used it, that it was soon proclaimed in the public prints, from Canada to New-Orleans, and appeared to be a standard remedy on the Mississippi and Ohio rivers, for this terrible disease.

The more this valuable article (myrrh) is examined, the more medical excellencies are discovered in its properties. This is the *medical giant* among the gums, balsams, and aromatics of the vegetable kingdom.

Antispasmodics and Nervines.

To procure rest for the nervous and arterial systems, when under great bodily or mental excitement, from disease or any other cause, and to induce refreshing sleep, without the use of narcotics, such as opium, morphine, &c.—This head should commend itself to all persons of strong and determined passions and weak bodies, or those of weak nerves and strong bodies.

CYPRIPEDIUM.

Ladies' Slipper—American Valerian, or Nerve Root.

ANTISPASMODIC, SWEETISH BITTER, SLIGHTLY TONIC, AND NERVINE.

To quiet mental and nervous irritability, and procure rest.

CYPRIPEDIUM.—*Flores—Folia—Radix.* The flowers, leaves and roots.

Cypripedium candidum (white ladies' slipper). The stem, leafy; leaves, lance-oblong; lobe of the left style, lanceolate, obtusish; lip compressed, shorter than the lanceolate petals.

Cypripedium parvilflorum (common ladies' slipper). Stem, leafy; lobe of the style, triangular-oblong, acute; outer petals, oblong-ovate, acuminate; inner ones, linear, contorted; lip shorter than the petals, compressed.

Cypripedium pubescens (yellow ladies' slipper). Stem, leafy; lobe of the style, triangular-oblong, obtuse; outer petals, oblong-ovate, acuminate; inner ones, very long, linear, contorted; lip compressed, shorter than the petals.

Cypripedium spectabile (red or gay ladies' slipper.) Stem, leafy; lobe of the style, oval-cordate, obtuse; outer petals, broad-oval, obtuse; lip longer than the petals, split before.

Cypripedium acaule (low ladies' slipper). Scape, leafless, one-flowered; leaves, radical, in pairs, oblong, obtuse; lobe of the style, round-rhomboid, acuminate, deflexed; lip longer than the lanceolate petals, split before.

There are six species of the cypripedium, or ladies' slipper, five of which we have thought worthy of a description in this work, as they all possess nearly the same medical properties, and may be gathered, pulverized, and used indiscriminately for the same complaints.

The roots are the only part of the plant that is generally

Cypripedium pubescens.

Lady slipper. Nerve root

used, although considerable medical virtues are found in the stalks and leaves.

The roots are large, fibrous, and closely matted together, each fibre originating in a solid root, parent, or centre, which may be found by parting the closely entwining members of this truly compact family. The main root puts forth several stalks, which grow about one foot in height.

The leaves resemble the itch, or Indian poke-weed, or *veratrum viride*, but are not as large.

The sexual character of the different plants of this species is distinguished by the form and color of the flowers. The flowers of the female plant are red, red and white, and white. The red has but two leaves, which grow out of the ground and lean over to the right and left, from between which a single stalk shoots up, to the height of from eight to ten inches, bearing on its top the flower, which is of a very singular form, and from which the sexual character of the plant is known.

The red and white and white ladies' slipper grows only in swamps and marshy ground, and is found to produce larger clusters of roots than the yellow, but in a similar form. The top of the yellow is similar to the red ladies' slipper, except the color of the flower.

The yellow and red are the best for medicine. The root should be dug in the spring before the stalk starts (as it may be easily found by the dead stalk of the previous year), or in the fall, when the foliage is dead. Then the whole substance of the plant is concentrated in the root. If dug in the summer, when the sap is abroad in the stalk and leaves, the roots will nearly all dry away. When procured, it should be washed clean and carefully dried and pulverized, and sifted through a fine sieve, and preserved from the air, for use.

Medical uses.—This medicine is one of the most valuable nervines, or antispasmodics, known. I have used it nearly fifty years, and have always found it to produce the most beneficial effects in all cases of nervous disease or hysterical affections; in fact, it would be difficult for the Thomsonian practitioner to get along in nervous cases without this valuable nervine. It is an innocent remedy, destitute of narcotic properties, and may be used in all cases of disease with safety, and is much better than opium, as it relieves the irritability by quieting the nervous system, whereas opium relieves by deadening in a great measure the natural excitable animal functions.

After the operations of the nerve powder, the patients feel lively, cheerful, and happy, as if they had received a substantial night's rest, after great fatigue of both body and mind. Whereas the opium leaves the patient dull, heavy and prostrate, both in body and mind; stupid in action, dull in intellect, sick

at the stomach, and with an awful foreboding in the imagination of an inexplicable something, that never had and never will have an existence this side of the grave; to relieve which, another dose of opium must be taken; and thus they continue to drag out a miserable existence, neither taking pleasure or comfort themselves, nor suffering others to do so, and running gradually down, and finding relief only in death.

Half a teaspoonful of this medicine may be taken or given in a glass of hot water, sweetened, and the dose repeated if necessary; or the same quantity may be used in any of the six numbers, or taken in the injections; and where there are nervous symptoms it should never be dispensed with.

FERULA ASAFETIDA.—Antispasmodics continued.

POWERFULLY ANTISPASMODIC, SLIGHTLY ASTRINGENT, EXPECTORANT, AND GENTLY LAXATIVE.

To quiet nervous irritability, relieve spasms, hysteria, cramp, convulsions;—regulates and comforts the mind.

ASAFETIDA.—The root of asafetida at full size is as large as a man's leg, tapering, and perennial; at the top there are numerous strong fibres; externally black—internally white, and abounding in an excessively fetid, milky juice. The leaves spring directly from the root, and are from seven to ten in number, about two feet in length. They are bipinnate, smooth, with the leaflets alternate, sinuate and lobed, sometimes lanceolate, of a dark green color, and of an exceedingly fetid smell. The stem rises from the midst of the leaves, and is luxuriant, herbaceous, from five to ten feet in height, and about three inches in diameter at the base, smooth, striated, round, erect, simple, and terminating in large convex umbels. The flowers are light yellow, the seeds are of a reddish color, oval, flat, and foliaceous. The leaves are said to differ much in shape, and the character of its fetid product, according to the soil on which it is cultivated. It is a native of Persia, and flourishes most abundantly in the mountains. The inhabitants of that country are said to eat it when young and tender, and sheep eat it greedily.

The old plant is the most productive, and it is not considered worth gathering unless it is four or five years old. When the leaves begin to fade, the earth about the top of the root is removed, and the leaves are twisted off and are thrown with other vegetable substances over the root, to protect it from the heat of the sun. After a few days, the summit of the root is cut off transversely, and the juice, which exudes, is collected; and then another thin slice is taken off, and the juice is again preserved.

This course is continued till the root is exhausted, which is generally in six or eight weeks. The sun is as much as possible excluded from the root while the process of gathering is going on. The juice when collected is dried in the sun.

One drachm of the juice fresh from the root will diffuse a more powerful effluvia through a close room than five hundred pounds of the article as generally used. The gum becomes softened by heat without becoming fluid, and is very difficult to pulverize. It is inflammable, and burns with a brilliant lively flame.

Its virtues are extracted by alcohol, and form a tincture, which when put into water turns it white. The odor of asafetida depends upon the oil, which may be extracted and separated by distillation, in water or alcohol, when it is of an exceedingly offensive taste, bitter and acrid. The active principle is in the volatile oil and the resin.

Medical uses.—Asafetida is a powerful antispasmodic, a moderate stimulant, feebly laxative, and an efficient expectorant. It is employed on account of its antispasmodic properties, in the treatment of hypochondriasis, hysteria, convulsions, spasms of the stomach and bowels, nervous disorders which accompany nervous dibility, &c. From the union of its different properties, or of the expectorant with the antispasmodic, it is highly useful in difficulties of the lungs, whooping cough, asthma, catarrh, and in sinking sensations. It may be given instead of nerve powder, and also used for constipation and flatulency. It appears to have been known in the east from the earliest ages, and at the present time is much used in Persia and India, as a condiment.

Preparations and administration.—It may be given in a pill, the size of a small pea, or in powders, from five to ten grains, or the tincture may be used, to the amount of one or two teaspoonsful, in any simple tea or in the form of injections. Take half an ounce of the gum, ground or cut fine, and the same quantities of composition and nerve powder, mix them well together, and give from half to a teaspoonful, in hot water, for violent attacks of hysterics, convulsions, coughs, spasms and colic.

We can add our testimony to the happy effects of this remedy. Having for several weeks labored under severe mental excitement, the virtues of the nerve powder were exhausted, when this remedy was recommended. After much persuasion, we were induced to take a pill at night on going to bed, but however without any faith in the virtues of the article; yet notwithstanding, we soon fell into a refreshing sleep, a gentle perspiration broke out, and in the morning we awoke from as comfortable a night's rest as we ever enjoyed. By continuing the

use of the pill for several nights, our mind became quiet, our nervous system regular, and the blessings of health soon returned.

Though its odor is offensive, the medicine ought not to be condemned.

LAURUS CAMPHORA.—Antispasmodics continued.

Camphor.

STIMULANT, BITTER, ANTISEPTIC, AND AROMATIC.

To promote mental exhilaration, warmth and perspiration; to remove faintness, and give temporary strength and tone to the stomach.

Laurus Camphora. *Concretum sui generis*, or a peculiar concrete substance.—*Calyx*, none. *Corolla*, calycine, six-parted. *Nectary*, with three two-bristled glands, surrounding the germ. *Filaments*, interior, glanduliferous. *Drupe*, one-seeded.

It is said that camphor is not confined to any one species of plants, but is widely diffused, and existing in a great variety. In the roots of the cinnamon, cassia, and sassafras laurels, it may be found, and is one of the constituents of the seeds of the cardamon and long pepper; it also exists in lavender, peppermint, thyme, sage, rosemary, &c. Its properties in most of those plants are so minute as to render it unprofitable to extract them. It is procured from the cinnamon tree by the inhabitants of Ceylon. It exudes from the bark of a tree unknown to botanists, in some parts of South America, and is collected by the natives. But the laurus camphora, and the dryobalanops camphora, are the camphor of commerce.

Laurus camphora.—This tree is an evergreen of good size, having the aspect of the linden tree, with a straight trunk below, but much divided above into branches, which are covered with a greenish smooth bark. The leaves, which stand upon long foot-stalks, are smooth, shining, ribbed, and of a pale green color, tinged with yellow on their upper surface, and from two and a half to three inches long. The flowers are small, white, and well collected in clusters, which are supported by long peduncles. It has a red berry, much resembling that of the cinnamon tree.

The tree is a native of Asia, growing in China and Japan. All parts of the plant are impregnated with camphor, and it is obtained from the trunk, branches and root, by sublimation. The following process is the most prevalent method of obtaining it. The smaller branches and roots are cut into small chips, and put into a large iron vessel with a little water, sur-

rounded by capitals of earthen, furnished with a lining of rye straw. The heat is then applied moderately, and the camphor becomes volatilized by the steam of the boiling water, rises, and is condensed upon the straw within the capitals.

Dryobalanops camphora is another species. It is the product of a tree on the islands of Borneo and Sumatra. The gum concretes in longitudinal cavities in the heart of the tree, in masses at certain distances apart, from a foot to a foot and a half long. The old trees are the most productive, and the number that afford quantities of the drug sufficient for extracting is small. One tree will yield from ten to twenty-five pounds, according to its size.

There is produced from the dryobalanops an oil, called the oil of camphor, which is highly valued as an external application in rheumatism and other painful affections. This oil is found in young trees which have not attained sufficient growth to produce camphor, and it is probably the fluid state in the developement of this useful substance, as it occupies the same cavities which are afterwards filled with camphor. It holds in solution a large quantity of this principle, and will yield an inferior quantity by artificial heat. The whole tree is pervaded by this juice, as the wood retains a fragrant smell, and is therefore the less liable to the attacks of insects, on account of which it is highly esteemed for cabinet work, &c.

Medical uses.—It is not definitely known how the system is affected by this substance. Its most powerful influence is felt upon the brain directly, and thence to the nervous system. The circulation which it always affects to a greater or less degree, is probably much involved through the agency of the brain. The effect of this medicine is various, as the quantity is increased or diminished. Given in moderation, it produces mental exhilaration, and in a healthy individual an increased heat of the surface, and perspiration. It increases the pulse in fullness and force. In some, it appears to act upon the urinary and genital organs, producing a burning sensation. Experience teaches, that it allays nervous irritation, and quiets restlessness.

In large doses it produces giddiness, and displays a more decided action upon the brain, creating mental confusion, with a disposition to sleep. In a morbid state of the system, it relieves pain, and allays spasmodic action. In still larger doses, it occasions anxiety, faintness, vertigo, nausea, vomiting, and delirium, and sometimes even death.

Camphor may be usefully employed as one of the constituents of the hot drops. In preparing the rheumatic liniment it imparts a stimulating, aromatic and pleasant flavor. A small particle of the gum may be used to advantage for dispelling wind from the body. It is a pleasant stimulant, for those who

choose it in preference to Cayenne, to expel wind from the stomach in cases of dyspeptic affections. It is useful to preserve goods or clothing from moths. If put into closets in which are preserves, sugar, or any kind of saccharine substances, it will keep off the small ants and other insects that are troublesome in hot weather; and for this purpose alone it is worthy the attention of all good livers, and especially *epicures.*

ICHTODES FŒTIDUS.—Antispasmodics continued.

Skunk Cabbage.

EMETIC, NARCOTIC, ANTISPASMODIC, STIMULANT, AND EXPECTORANT.

To quiet the nervous system in hysterics—useful in catarrh, chronic rheumatism, and phthisis pulmonalis, or consumption.

ICHTODES FŒTIDUS.—*Radix.* The root.

The *skunk cabbage* has a large perennial root, abrupt, and furnished with numerous fibres, which penetrate to the depth of a foot or more. The *spathe*, which appears before the leaves, is acuminate, obovate, obliquely depressed at the apex, auriculated at the base, folded inward at the edges, and of a brownish purple color, varied with spots of red, yellow, and green. At the beginning of May, the leaves are fully developed, and are very large, being from twelve to eighteen inches long, and from nine to twelve broad.

This plant is indigenous, growing abundantly in meadows, swamps and other wet places, in most of the middle and northern states. It flowers in March and April, and in lower latitudes as early as February. The fruit is quite ripe, and the leaves decay before the end of August. The plant is very conspicuous, from the abundance and magnitude of its leaves. All parts of it have a fetid, disagreeable odor, resembling that of the offensive animal after which it is named. This odor resides in an extremely volatile principle, which is rapidly dissipated by heat, and diminished by desiccation. The root is the part usually employed in medicine. It should be collected in autumn, or early in the spring, and dried with care.

Medical uses.—The properties of this root are stimulant, antispasmodic, and narcotic. In large doses it occasions nausea and vomiting, with headache, vertigo, and dimness of vision. It is useful in asthma, chronic catarrh, chronic rheumatism, and hysteria. The pulverized root has been extensively used in the Thomsonian practice, as a stimulant and expectorant in their cough powders. It may be used in powder, in teaspoonful doses, to good advantage, taken in hot water, sweetened, or

Solanum dulcamara.

Bitter sweet, Woody night shade.

in the syrup of any kind of preserves, or mixed with honey. It is good for asthma, cough, difficulties of the lungs, fits, or any spasmodic affections. It may be used in small doses of a fourth of a teaspoonful, and be taken five or six times a day, in any of the ways before mentioned.

For cough or dropsy, it had better be taken on going to bed, in hot water, placing a hot stone or brick or jug of hot water at the patient's feet. When the cough is light, an equal quantity of *arum triphillum*, or Indian hemp, may be mixed with the skunk cabbage, and the same quantity prepared and taken as above directed on going to bed. If the patient is troubled with a cough during the night, let this stand by the bed, where he can take a teaspoonful occasionally.

SOLANUM DULCAMARA.—Antispasmodics continued.

Bittersweet— Woody Nightshade.

SEDATIVE, DIURETIC, NARCOTIC, EMETIC, AND ANTISCORBUTIC.

Used mostly by Thomsonians in nerve ointment, to remove stiffness of the joints, callouses, strains, and relax contracted muscles.

Solanum Dulcamara.—*Semina—Caulis—Cortex—Radix.*—The seeds, stalk, bark of the body, and root.—The *stem*, unarmed, woody, climbing. Lower *leaves*, mostly cordate, glabrous; upper ones, mostly guitar-hastate. Few *flowered*, corymbs opposite to leaves. This is the true bittersweet. The *celastrus scandens* is sometimes mistaken for the *solanum*.

The bittersweet is a climbing shrub, from six to ten feet high, with a slender, branching, woody stem. The leaves are alternate, ovate, petiolate, pointed and smooth; the vines soft, and of a brownish green color. The flowers are arranged in elegant clusters, standing opposite to the leaves. The calyx is small, rather purplish, and divided into five segments. The wheel-shaped corolla has five pointed segments, which are violet blue, with a purple vein running through their centre, and two bright green spots at the base of each. It has short filaments, and supports large erect, yellow anthers, which are arranged in the form of a cone, completely encircling the style. The oval-shaped berries are of a bright scarlet color, and continue to hang upon the bush in beautiful clusters, after the leaves have gone to decay.

The bittersweet flourishes best in damp and sheltered places, as on the banks of running water, among thickets, along fences, and in moist meadows. It abounds throughout the United States, and is in bloom in July and August. The root, stalk,

and berries, possess the medical properties of the plant. The berries were formerly considered poisonous, and were, without cause, thought to act with great severity upon the stomach and bowels.

After the fall of the leaf in autumn, bittersweet should be gathered, the twigs as well as the bark of the body and root. The best is that which grows on high and dry situations.

Medical uses.—The properties of bittersweet are narcotic, with the power of increasing the secretions of the kidneys and skin. In several instances, we have observed a dark purplish color of the face and hands, and at the same time considerable languor of the circulation, when the system was under its influence.

Its narcotic effects do not become obvious, unless taken in over doses. It then produces faintness, vertigo, nausea, vomiting, and spasmodic muscular movements. It is now mostly confined to the treatment of leprous and other cutaneous eruptions, particularly those of a scaly character. Its operation upon the secretions is insufficient to account for its favorable effects, and we must therefore ascribe them to an alterative action. In some cases it has been beneficially employed in chronic rheumatism.

It is said to be useful (and we think, from its properties, with much reason,) in mania connected with strong venereal propensities. It may be used in decoction, of which take a foot-glass three or four times a day, and increase the quantity till some slight disorder of the head indicates the activity of the medicine.

In cutaneous affections, a strong decoction may be applied to the skin, at the same time that the medicine is taken internally. The extract may also be taken, in doses of from five to ten grains. A dose of the powder should be from one to three teaspoonsful, taken in warm water.

NERVE OINTMENT.

Take of the bark of the roots of bittersweet, with the berries, two parts; wormwood and chamomile, of each one part; all of which should be green—but if dry, moistened with hot water; put one pound of the above mixture, after being well bruised, into one gallon of porpoise or horse oil, or any other soft animal oil—simmer them over a slow fire for twelve hours, then strain off and add one ounce of spirits of turpentine and half an ounce of the spirits of camphor for each pound of the ointment.

This preparation is to be used for bruises, sprains, callous swellings, stiff joints, and corns. It should be rubbed upon the affected part, and dried in by the fire, or by holding as near it as can be borne, some heated article; after which put bandages

of flannel about the part and keep it warm. It is very good for cracked hands, or roughness upon the skin.

But a more pleasant liniment may be made by bruising the root and simmering it in fresh butter, after which scent it with burgamot, or any kind of aromatic oil used as perfumery, to render the smell agreeable.

Antiscorbutic Remedies.

This head should commend itself to all scorbutic cases, such as *venereal, gout, rheumatic, scrofulous, leprous, nephritic*, and all difficulties of the *blood* and *skin*.

ARCTIUM LAPPA.

Burdock.

ANTISCORBUTIC, APERIENT, SUDORIFIC, DIAPHORETIC, DIURETIC, AND TONIC.

To cleanse the blood of morbid humors, the seeds and root stand in the front rank of the antiscorbutic remedies—also in all such diseases as gout, venereal, rheumatism, scrofula, &c

ARCTIUM LAPPA. *Semina—Folia—Radix*.—The seeds, leaves and root.—The cauline *leaves*, heart-form, petioled, toothed. *Flowers*, panicled, globose. *Calyx*, smooth.

The *burdock* is a very common, biennial plant, with a large, tapering root, from twelve to eighteen inches long, dark brown externally, but very white and spongy within, having withered scales near the top. The stem is branching, pubescent, succulent, and two or three feet in length, having very large leaves, which are dark green upon their upper surface, whitish and downy beneath, and have very long foot stalks. The flowers are globose, purple, and arranged in panicles. The imbricated calyx consists of scales with extremities that are hooked, by which they attach themselves to cloth and the coats of various animals. The down of the seed is prickly and rough; the bur many-seeded, and the seeds are quadrangular.

Burdock is abundant in this country, growing in pastures, fields, and along the road side, in cultivated grounds, and among rubbish. The root should be dug in the spring, before the leaves start, or in the fall, after the top is dead, as then it possesses the full strength of the entire plant. The odor of the root is weak, but unpleasant—the taste is mucilaginous and sweetish bitter, with a slight degree of astringency. The seeds contain essential oil, and are aromatic, bitterish and somewhat acrid.

Medical uses.—The root is considered sudorific, diaphoretic and aperient, without irritating properties; and is good in leprous, rheumatic, scrofula, scorbutic, gouty, venereal and nephritic affections. Perseverance and close application are necessary in order that the system may feel effectually the benefit of this antiscorbutic remedy. A decoction may be prepared, by boiling four ounces of the green root well bruised in two quarts of water, and half a pint of it taken three times a day.

The seeds are diuretic, and may be used in the form of powder, of which a teaspoonful may be taken two or three times a day. The leaves may also be used to great advantage as drafts on the feet. They may also be taken green, rolled, and saturated with vinegar, and applied as warm as can be borne on any part of the body suffering with pain. Remember always to apply them hot, and put about them a bandage of woollen cloth or flannel, to excite perspiration. The leaves may be dried, and kept for applying to burns, &c.

No. 1. Antiscorbutic Syrup.

Take of dock roots and burdock seeds, each one pound; burdock and lovage roots, each two pounds; American senna and green ozier bark, each one and a half pounds; let them all be green as possible, bruise them thoroughly together, put them into a large kettle, and add eight gallons of soft spring water; boil for two hours, then strain off and add one gallon of molasses and the same quantity of Jamaica rum; shake them well together, and keep it tight in jugs for use.

Dose, from a quarter to one glass, from four to six times a day.

No. 2. Antiscorbutic Syrup—*A valuable article.*

Take of the yellow or narrow dock and burdock roots, each one pound; burdock seeds and American senna, of each one half a pound; pulverize and mix them well together, and then boil in ten quarts of water for half an hour; strain off, and add half a gallon of brandy, and the same quantity of molasses. Keep it bottled close for use. This is one of the best antiscor butic syrups I have ever made, for all humors of the body.

Dose, from a fourth to half a glass, three times a day, or less or more, according to the circumstances of the case.

While using the antiscorbutic syrups, purified lime water, made from oyster shells, should be freely used. The above compound embraces the most powerful antiscorbutics known to us in the vegetable kingdom. These receipts are of incalculable value to the scorbutic patient.

The articles may be prepared in less quantities, by observing

the same proportions. If all the articles cannot be had, make a tea of such as you can procure, and use that instead of the syrup.

MACROTYS SERPENTARIA.—Antiscorbutics continued.

Black Snakeroot—Cohosh.

STIMULANT, TONIC, ANTISPASMODIC, A POWERFUL EMMENAGOGUE, DIURETIC, AND ANTISCORBUTIC.

For stimulating the secretions of the body, expelling rheumatic pains, and removing female obstructions, and has much influence over the nervous and arterial systems.

Macrotys Serpentaria.—*Radix.* The root. *Calyx,* four or five leaved. *Petals,* four to eight, diformed, thickish, sometimes wanting. *Capsules,* one to five, oblong, many-seeded. *Seeds,* squamose.

The *black cohosh* is a tall herbaceous plant, from six to eight feet high, with a perennial root. The leaves are large, consisting of oblong, ovate leafets, toothed and incised at the edges. It has small white flowers, disposed in a long terminal raceme, with occasionally two short racemes at the base. The calyx is white, deciduous and four-leaved. The petals are minute, and shorter than the stamens. The pistil consists of a sessile stigma and an oval germ. The fruit is an ovate capsule, containing many flat seeds.

The *black snakeroot* grows in rocky woodlands throughout the United States, and flowers in July and August. The root is the only part used as medicine.

Medical uses.—The properties of this plant are stimulant, tonic, and have a powerful action on the secretions of the uterus, kidneys, skin, and the mucous membrane of the lungs. It has a strong affinity for the uterus, and exerts great influence over the nervous and arterial systems.

It is employed in cases of rheumatism, dropsy, hysterics, and various affections of the uterus, and consumption of the lungs; in such cases it is very useful, on account of its stimulating and expectorating qualities. For convulsions, occasioned by periodical uterine difficulties, this is a valuable remedy. For rheumatism, or female obstructions, it may be used in form of decoction, or as bitters.

Take half a pound of the roots, and bruise them well in a mortar, pour upon them one pint of boiling water, let it steep for ten minutes, then pour it off and let it cool; put it into a jug and add a quart of good Holland gin; let it stand twelve hours, to extract the strength of the roots, being often shaken.

Dose, a wineglassful, from three to six times a day. It will very soon begin to show the effects of its activity; if in female obstructions, by removing the difficulty; if in rheumatic pains, in easing the patient; and so on for the variety of complaints in which it is beneficial.

This medicine should not be taken by females in a state of utero gestation, as it will produce abortion, and consequent debility, and weakness of the constitution.

CHIMAPHILA UMBELLATA.—Antiscorbutics continued.

Princess Pine—Pipsissewa—Bitter Wintergreen.

ANTISCORBUTIC, DIURETIC, ASTRINGENT, TONIC, AND STIMULANT.

Used much the same as Burdock, Dock and Lovage.

CHIMAPHILA UMBELLATA. *Semina—Herba—Radix.* The seeds, herb, and root.—*Calyx*, five-toothed. *Style*, very short, immersed in the germ. *Petals*, five. *Stigma*, annular, orbicular, with a five-lobed disk. *Filaments*, stipitate. *Style*, discoid, ciliate. *Capsules*, five-celled, opening from the summits, margin unconnected.

The *Pipsissewa* is an evergreen, with a small, perennial, yellowish root, which gives off several simple, erect stems, from six to eight inches high. Leaves, wedge-shaped, somewhat lanceolate, serrate and smooth, of a shining green color, supported upon foot-stalks, in irregular whorls. The flowers are arranged in terminal corymbs, and stand upon peduncles. The calyx is divided at its border into five segments. The corolla is composed of five spreading petals, which are of a whitish color, tinged with red, and give an agreeable odor. It has ten stamens, the filaments shorter than the petals, with purple anthers. The germ is depressed, and supports a thick sessile stigma, the style being immersed in the germ. The seeds are linear, chaffy, numerous, and enclosed in a depressed, roundish, five-celled capsule, with the persistent calyx at the base.

This beautiful plant is a native of the northern and middle states, and of Europe and Asia. It is found in all parts of America, and extending to the Pacific ocean. It grows in a loose, sandy soil, in deep shady woods, and is surrounded by decaying leaves. It flowers in June and July. Every part of the plant is possessed of active properties.

The *spotted pipsissewa*, *Chimaphila maculata*, possesses much the same properties as the one above described, and is distinguished from it by the character of the leaves. The leaves

of the maculata are lanceolate and round at the base, but are broader near the summit, and are of a deep olive green color, striped with veins of a greenish white. Those of the umbellata are broadest near the summit, and gradually narrowing to the base, and of a dark shining green.

Wh n dried and exposed to the light, the color fades much, but does not lose its greenish hue. The leaves of pipsissewa when fresh and bruised give a peculiar odor, and have a pleasant bitter, astringent, sweetish taste. The roots and stems have a considerable degree of pungency. Its active properties are imparted to boiling water and alcohol.

Medical uses.—The active properties of this valuable plant are tonic, antiscorbutic, and astringent. It is extensively employed in rheumatism, scrofula, and nephritic or kidney complaints.

We have been in the use of this plant for upwards of forty years, in dropsical, cancerous, and other sharp, acrid, scrofulous complaints. It is an excellent diuretic, and is good for dyspeptics, and for general dibility. It may be always used to advantage in difficulties of the kidneys and bladder; it is also good in cases of stone, and for scrofula before and after ulceration, as it cleanses the blood, and reduces the quantity of bad humor, which causes the ulcers; and by washing the sores in the tea it cleanses them, and thus facilitates the healing process. In obstinate, ill-conditioned ulcerations and cutaneous eruptions, it has proved itself highly valuable. In such cases it is used internally as a drink, and externally as a wash.

The leaves and seeds may be simmered with burdock and lovage seeds, in fresh butter or lard, with a little beeswax, and used for salt-rheum, scald-head, cracked hands, sore nipples, ulcers and old sores. Those troubled with scrofula should use a tea of the leaves constantly, and drink nothing else till the difficulty is removed. It may be made into beer, with green osier, burdock and lovage, roots or seeds.

Take one pound of pipsissewa, one fourth of a pound of fine ginger, one pound of green ozier bark, a fourth of a pound of burdock seeds, and a fourth of a pound of lovage seeds; pulverize the whole quantity, and put it into three gallons of soft spring water and boil for an hour, then strain off and press out the juice and sweeten it with molasses; when about milk warm add half a pint of yeast, and in from twelve to eighteen hours it is fit for use. This is a valuable beverage.

If the burdock and lovage seeds cannot be had, use instead, one pound each of the roots. The articles ought all to be fresh gathered.

Take a glass of this six or eight times a day, unless it ope-

rates too severely. In all cases, the quantity to be taken must be regulated by discretion.

CORNUS CIRCINATI.—Antiscorbutics continued.

Green Osier—Round-leaved Dogwood.

ANTISCORBUTIC, BITTER, ASTRINGENT, AROMATIC AND TONIC.

To strengthen the stomach and remove scorbutic difficulties.

CORNUS CIRCINATI. *Folia—Cortex.* The leaves and bark. The *branches* warty. *Leaves* broad oval, acuminate, white—downy beneath. *Cyme* much spread. About eight or ten feet high. *Berries* blue, involucre, usually four-leaved. *Petals* superior, four druped with a two-celled nut. There are several different species of the *Cornus* growing in this vicinity; all of which in a great degree resemble each other in their medical properties.

The *Cornus circinati* is a shrub from eight to twelve feet high. The branches are covered with small excrescences or warts; the leaves are large, pointed, with rough edges; downy beneath. It has large white flowers disposed in cymes. The berries are blue. This tree is a native of the United States, growing from the Carolinas to the British Provinces, on the sides of hills and the banks of rivers. It flowers in June and July.

Medical uses.—The bark when dried is of a whitish ash color, and when powdered resembles that of the bitter root. It has an astringent, bitter, and aromatic taste. It possesses properties very similar to the Cornus Florida, and may be employed in the same way as a substitute. It is much used as an astringent and tonic. The most eligible preparation is to pour a pint of boiling water on two ounces of the bark, fresh, if it is to be had; let it steep half an hour, and take of it a wine glass full two or three times a day. A tea made of the leaves may be used to advantage as a constant drink, by those laboring under scorbutic difficulties. The leaves rolled to make them soft and wet in vinegar, are an excellent application to reduce inflammation, especially that of the eyes. In case of an inflamed bruise, if the leaves are prepared, as above mentioned and applied to the injurd part, at the same time giving internally composition tea, the perspiration will start beneath the leaves and the pain will be removed. They are a valuable article and should be kept on hand.

EYE WATER No. 1.

Eye water may be prepared by putting a handful of the bark from the tree into a small quantity of hot water; let it stand long enough to be well saturated, then add about the same quantity of fourth proof Jamaica rum, and let it remain for two or three days, then strain and press out the juice from the bark and preserve for use. This preparation may also be used as a wash for sores to reduce the inflammation. Simmer the bark, when bruised fine, in fresh butter or lard, and it makes an excellent *soft ointment* for old sores, cracked hands, sore lips or nipples and sore eyes, where the lashes are inflamed. When made into an ointment or syrup, this valuable article may be used advantageously in a great number of complaints, especially when the blood is impregnated with sharp acrid humors. A fine cool beverage may be made, by putting the green leaves into cold spring water: this is not only cooling but soothing both to the body and mind, and is good to drink in putrid and inflammatory disorders.

EYE WATER No. 2.

Take of the fresh gathered bark of green osier, four ounces, of the root of yellow lily, well cleansed, the same quantity, bruise them well together, and steep them moderately in two quarts of soft water, in a stone pot for three hours, stirring them occasionally; then strain off and add two ounces of fine loaf sugar, and an eighth of an ounce of saleratus, and half a pint of fourth proof Jamaica rum. A small piece of white vitriol half the size of a walnut, may also be pulverized and added; this we add knowing it to be good in case of sore eyes. This wash will cleanse the eye of all offensive matter, remove the itching or irritation, and restore it to a healthy condition. If too strong it may be reduced. To be used night and morning, or whenever the eye is irritable.

Sore eyes are generally accompanied with a torpid state of the bowels, which causes a pressure of blood and other fluids upon the ball of the eye. In such cases use injections of a tea of cayenne, sweetened with molasses. The feet may be bathed in hot water and liniment, to aid in equalizing the circulation.

OINTMENT FOR HEMORHOIDES OR PILES.

Take of lovage seed, burdock seed, and prickley ash bark, each one ounce; bark of green osier, the flowers of yarrow and pipsessewa, each two ounces; pulverize and simmer all the articles well together in two pounds of fresh butter or lard for two or three hours over a slow fire; or it may be kept in a white earthen or brass vessel, where it will simmer very slow-

ly for a day or two, in order that all the strength of the articles may be extracted; then strain and press out all the liquor. This is a very valuable article for the piles, and every species of old sores. Before using it let the sore be washed with clarified lime water. This is also an excellent ointment to put upon the neck and breast for quinsy or putrid sore throat, after which put a flannel about the neck. It is also good for stiff joints and rheumatic pains, in such cases add a little cayenne. It is useful to be applied to the back of females who are irregular in their menstrual discharges. Let it when applied always be dried in by the fire or by holding near some heated substance. Practitioners should always keep this on hand.

RUMEX.—Antiscorbutics continued.

Docks.

ANTISCORBUTIC, APERIENT, ASTRINGENT AND TONIC.

Useful in scorbutic and other complaints. The same as other articles under this head.

RUMEX *Aquaticus*,
Britanica.
Obtusifolius, } *Radix—Folia.* The root and leaves.

There are six species of dock, all possessing nearly the same virtues, so much so that we think it unnecessary to define the particular qualities of the different species separately. They are all herbaceous, with long, fleshy, perennial roots. The flowers are axillary or terminal; some of the species are diæcious; but all of them have perfect flowers. The rumex aquaticus, rumex Britannica, and rumex obtusifolius are the most useful.

The properties of the root from whatever species derived, are bitter and astringent, with but little odor. It yields its virtues to water and alcohol, rapidly. The leaves of the docks are edible and much used as spinage, in the spring, when they are young and tender. They form an excellent diet in scorbutic cases and are usually laxative. The roots are an excellent article to dye yellow.

Medical uses.—The medical qualities of the dock roots are anti-scorbutic, astringent, and mildly tonic. They also possess alterative properties which renders them very useful in scorbutic disorders and cutaneous eruptions. It has sometimes proved useful, compounded with bitter root, in the venereal disease. It has from long use proved a valuable remedy in *icthyosis*. or a dry, scaly, scorbutic, or leprous state of the skin. The roots of most of the species unite a tonic with a laxative astringent property, much resembling that of rhubarb, in their operations.

Myrica gale.

Meadow fern. Sweet gale. Dutch myrtle

Dock root may be employed to the best advantage made into syrup, but it may be given in the form of decoction or powders. Four ounces may be bruised and steeped in a quart of hot water and a foot glass of it taken six or eight times a day. The root simmered in fresh butter, with the addition of a little fine lovage, prickly ash and burdock seeds makes an excellent ointment for the itch and all scorbutic appearances of the skin. While using this ointment the body should be washed once or twice a week in pure lime water, diluted with whiskey and soft water. This will neutralize the bad humors and morbid matter that has worked out upon the surface. At the same time take a wineglass full of the dock tea three times a day, also take a little of the lime water; the one will purify the blood, the other will neutralize the morbid humors of the body and render them harmless. The dock is one of the most valuable constituents of the antiscorbutic syrup. (See article Burdock.) The pulverized root is also a good dentrifice for the teeth and gums.

MYRICA GALE.—Antiscorbutics continued.

Meadow Fern—Sweet Gale—Baybush.

ANTISCORBUTIC, AROMATIC, AND STIMULANT.

For all poisonous eruptions, such as salt-rheum, itch, tetter, erysipelas—or for sores on the lips, ears, face, or any part of the body.

Myrica Gale. *Semina—Fructus—Folia.* The seed, the fruit and leaves.—The *leaves*, wedge-lanceolate, obtuse, serrate at the apex. Staminate *aments*, imbricate. *Scales*, acuminate, ciliate. *Fruit*, in a scaly head.

It is very abundant by the side of fresh ponds in the northern states, and especially in some parts of Massashusetts. This shrub grows in thick bunches or clusters, and is from two to three feet high.

When the leaves have fallen from the shrub, the whole of its strength seems to be concentrated in the bur and bud, which, on being bruised, exhibit a balsamic or resinous substance, resembling balm of Gilead buds. They are a powerful aromatic and stimulant. They may be pulverized fine and simmered in cream, or lard, or fresh butter, which makes an excellent ointment for cutaneous eruptions.

Medical uses.—This ointment is a valuable remedy for all cutaneous eruptions, and especially in such cases as are mentioned at the head of this article. It is also good for all kinds of old sores, chapped hands and feet, sore nipples, and burns, if made sufficiently soft.

A syrup or beer, made as follows, may be drank while the ointment is being used.

Take two pounds of the leaves of meadow fern, boil them an hour in three gallons of water; strain off, and boil in this decoction half a pound of scorched wheat bran, set it away and let it cool and settle; then strain off, and heat it boiling hot and add four ounces of pulverized burs and buds of the same shrub, and let them simmer for ten or fifteen minutes; then let it cool with the last mentioned ingredients in it. When about blood warm, add a pint of good yeast and half a gallon of molasses. It will ferment, and in about twenty-four hours will be fit for use.

A half pint of this may be taken before eating, three times a day. A teaspoonful of cream of tartar may be used in this drink every night before going to bed, which will clear the bad humors from the system immediately. A wineglassful of the lime water may be used once or twice a day.

The surface of the body may be bathed occasionally with lime water and tincture of lobelia, to remove the morbid matter from the skin. The applicaton is very useful in effecting a cure.

XANTHOXYLUM FRAXINEUM.—Antiscorbutics continued.

Prickly Ash—Tooth-ache Bush.

ANTISCORBUTIC, ANTISPASMODIC, STIMULANT, AND DIAPHORETIC.

To warm and invigorate the system, and remove morbid humors.

XANTHOXYLUM FRAXINEUM.—*Flores*, *Semina*, *Cortex*, *Radix*. The flowers, seed, bark and root.

The *prickly ash* is a small, shrub-like tree, from eight to twelve feet high, with spreading branches, which are thickly studded with strong, sharp, thorn-like prickles. The leaves are pinnate, consisting of several pairs of leaflets, and a terminal one with a short foot-stalk, which is frequently prickly on the back, but sometimes unarmed. The leaflets are sessile, ovate, acute, and slghtly downy on their under surface. The flowers are small, greenish, and are disposed in umbels near the base of the young shoots. The capsules are of a greenish red color, with two valves, and one oval, blackish seed.

This shrub is indigenous, growing in moist, shady places, throughout the northern, middle, and western states. Its flowers appear before the leaves, in April and May. The leaves, flowers and capsules, have an aromatic odor, analogons to that of the oil of lemons. The flowers, bark and seeds, are used by

Xanthoxylum fraxineum

Prickly ash

Thomsonian practitioners. The bark is very thin and brittle, quite inodorous, and of a taste which is at first stimulant, then sweetish, slightly aromatic, and then bitter, and ultimately acrid.

Medical uses.—The prickly ash is an active stimulant, producing when swallowed a sense of heat, with some arterial excitement, and a tendency to perspiration. The berries are very pungent, and powerfully stimulant, as also are the bark and flowers. The bark and seeds should be pulverized for use. It is a valuable addition to bitter compounds, and it may be taken alone in hot water or wine. It is a good ingredient in the wine bitters; it is good for fever and ague, for which it is much used in the western states; and it is also good for cold hands and feet.

It is an antiscorbutic and antispasmodic stimulant, and a powerful diaphoretic. If a person is habitually cold, or troubled with chills, it will cause a genial glow of warmth to pass almost imperceptibly through the system.

The seeds, pulverized and simmered in fresh butter, or kept warm for three or four days in any soft animal oil, make an excellent rheumatic ointment, and which is good for pains in the limbs, back, or side. Let it be well dried in.

For inflammation in the jaws, or toothache, this is an excellent article. Let a poultice of it be applied to the face, and at the same time chew a few of the seeds, and keep them by the affected part; this will soon afford relief.

The tincture of the bark or seeds, reduced with twice its quantity of water, with the addition of a little alkali, is an excellent fomentation for bathing the surface of the body after steaming. This is particularly useful in cases of rheumatism, where the tincture may be used in its full strength. Before applying this, rub the skin well with a coarse towel, and then apply it with much friction.

VALUABLE SYRUP.

℞ Take the pulverized seeds, and peach meats, of each two ounces, put them into one pint of fourth proof Jamaica rum, and add loaf sugar sufficient to make it of the consistency of molasses. This is one of the best remedies for syncope or faintness used in the Thomsonian practice.

ACHILLEA MILLEFOLIUM.—Antiscorbutics continued.

Yarrow—Millfoil.

SLIGHTLY AROMATIC, BITTER, ASTRINGENT, AND MODERATELY STIMULANT.

Used in rheumatic affections in decoction, and for sores in ointment.

ACHILLEA MILLEFOLIUM. *Flores—Folia—Radix.* The flowers, leaves and root.—The *leaves*, two-pinnatifid, downy; the divisions linear, toothed, mucronate. *Stem*, furrowed.

Yarrow is a perennial herb, common to Europe and America, growing along fences, on the borders of woods, in old fields and in highways. It is from twelve to eighteen inches high, and is known by its doubly pinnate, divided leaves. Its flowers appear from June to September. The flowers and leaves, which are used as medicine, have an agreeable, aromatic odor, and a bitterish, astringent, pungent taste.

The plant owes its valuable properties to a volatile oil, which may be separated by distillation, and has the flavor of millfoil in a great degree. The active principles can be extracted by water or alcohol. The properties of the herb are astringent, tonic, and aromatic. It has been used in intermittents, and as an antispasmodic in colic, and various nervous affections. It may be used in decoction. The oil may be given in doses of from five to ten drops.

Medical uses.—The flowers may be simmered in lard or fresh butter, with equal quantities of green ozier, lovage seeds, and prickly ash bark, first being bruised in a mortar. Strain and press out all the ointment, and you have a valuable remedy for piles, either internal or external. For internal application, melt it and apply it with the tip of a goose quill.

It is good for all kinds of inflammatory sores, sore eyes, salt-rheum, and cracked hands.

LIGUSTICUM LEVISTICUM.—Antiscorbutics continued.

Lovage—Smellage.

STIMULANT, AROMATIC, CARMINATIVE, DIAPHORETIC, AND EMMENAGOGUE.

To be compounded with burdock, and used for scrofula, venereal, rheumatism, and female obstructions.

LIGUSTICUM LEVISTICUM. *Semina—Folia—Radix.* The seed, leaves and root.—The *leaves*, long, numerous. *Leaflets*, above, gashed. Strongly aromatic, especially the seeds.

Lovage is a perennial, umbelliferous plant, growing wild in the northern and middle states, and is much cultivated in gardens. It has a strong, aromatic odor, and a warm, pungent taste. It emits a yellow, opaque juice, when wounded, which dries into a brownish, resinous substance. The roots, stem, leaves and seeds, all have been employed; but the seeds have the aromatic and antiscorbutic properties of the plant in the highest degree. They are somewhat flattened, small, ovate, oblong, strongly ribbed, and of a yellowish brown color.

The medical properties of lovage closely resemble those of angelica. It possesses strong stimulating and aromatic properties, and has been employed as a carminative, diaphoretic, and emmenagogue. The best forms to use it in are syrups and infusions.

Medical uses.—This article may be usefully employed as an antiscorbutic, in connection with burdock, yellow dock, &c. (See burdock syrup.) A quantity of the root may be bruised and boiled in water, one pound to a gallon, for fifteen minutes; strain off, and add when hot a quarter of a pound of the pulverized seed, sweeten with loaf sugar, and add three pints of the best West India rum. Put the liquor with the seeds into a jug, and stop it tight for use.

This is an excellent remedy for females who have taken cold, and their monthly turns stopped; as it is an emmenagogue, and stimulates and warms the whole system—promoting perspiration and an active circulation. It will operate well in cases of venereal, and other scrofulous difficulties.

ANTISCORBUTIC SYRUP.

Take of lovage roots and angelica roots, each half a pound; of lovage seed, angelica seed, and senna, each one fourth of a pound; pulverize, and boil in two gallons of water for fifteen minutes; strain off, and press out the liquor, and sweeten well with loaf sugar, and then add a gallon of West India rum.

This is an excellent article for a suppression of the menses, or any obstruction or irregularity of the menstrual discharge.

Dose, half a wineglassful two or three times a day.

CUBEBA.—Antiscorbutics continued.

Cubebs.

AROMATIC, ANTISCORBUTIC, DIURETIC, MODERATELY STIMULANT, CARMINATIVE, STOMACHIC, AND TONIC.

A good remedy in gonorrhœa, and the first stages of syphilis.

PIPER CUBEBA.—*Fructus.* The fruit.

The *cubeb* is a perennial, climbing, vine, with a smooth, jointed stem, with entire, oblong, ovate, or lanceolate leaves,

which in the old vines are unequal at the base, less than an inch long, and supported upon short foot-stalks. The fruit or berry grows in clusters, and is about the size of a small pea, of a brownish grey color, and has a short stalk, which appears to be continuous, with raised veins, that run over the surface of the berry like net work. The aromatic flavor of the berry is agreeable to the taste, bitterish and camphorous, leaving in the mouth a sense of coolness, smilar to peppermint oil. The powder is dark colored, and of an oily appearance. It loses its strength when exposed for any length of time. The berries should always be kept whole till wanted for use.

Medical uses.—Cubebs are diuretic and stimulant, acting with considerable force upon the kidneys. If used in large quantities, they produce headache and vertigo. Nausea, vomiting, and a gentle purge, are the attendant consequences of their excessive use; and a sense of coldness is experienced in the rectum similar to that produced on the sense of taste. This article has long been used in the East Indies for gonorrhœa, gleet, and is a grateful stomachic, tonic, and regulator of the digestive organs.

It is best used in the form of syrup, compounded with equal quantities of burdock seeds, lovage root, green osier bark, and senna, to make it operate more effectually. A half of a pound of each may be put into two gallons of soft water and boiled one hour, then strained and sweetened with molasses, with the addition of spirits sufficient to prevent its becoming sour.

Dose, half a wineglassful six or eight times a day, or until it operates sufficiently; then graduate its use, and keep up a gentle movement of the bowels until the disease is cured—during which time a teaspoonful of balsam copaiva may be used two or three times a day, or till a slight sense of weakness is felt in the back.

Cathartics.

Whatever may be said in this book in relation to physic, will be done on the responsibility of the subscriber; for it is well known that Dr. Samuel Thomson is against the extensive use of cathartic medicines; consequently the part we have taken in writing the articles is not to be regarded as his opinions; or that he is to be considered inconsistent in his views for what we have done.

We have selected from the vegetable kingdom, some of the most soothing and mild cathartics, to be used by those who will, if they cannot obtain a gentle dose of physic from a Thomsonian, go to the "regular physician," and blindly take *calomel, croton oil, gamboge,* and the most powerful, drastic, and deadly drugs that are to be found in the shops; by which means many

times lives are lost, for the want of the knowledge of a simple dose of *peach-leaf tea, bitter root, senna,* or *castor oil.* The Thomsonian, if he wishes to keep his patients, and be enabled to save them, must, if it be necessary; respect those little prejudices to which the mind of every individual is more or less subject; and which, like religious, political, or any other preconceived opinions, must be reasoned rather than forced out of them.

It is, therefore, to protect the lives and health of the unsuspecting, that the subject of physic is agitated at this time and place. J. T.

SOLANUM LYCOPERSICUM.

Tomato—Love Apple.

CATHARTIC, DIURETIC, CARMINATIVE, TONIC, DIAPHORETIC, AND STIMULANT.

To correct the morbid state of the bowels, the secretions of the liver, aad restore the digestive organs.

Solanum Lycopersicum. *Semina—Fructus.* The seed and fruit.—The *stem*, unarmed. *Leaves*, pinnatifid, gashed. *Racemes*, two-parted, leaflets. *Fruit*, glabrous, torulose.

The *tomato* is a plant about two feet high, with a large succulent stem and branches. The plant collectively, except the fruit, much resembles the common potato vine. The fruit is esculent, and much used for culinary as well as medical purposes.

Medical uses.—The expressed juice of the tomato has proved a valuable remedy in our practice, for liver complaints, dyspepsia, constipation of the bowels, and obstruction of the biliary ducts.

Take one bushel of fresh gathered tomatoes, bruise and squeeze out the juice through a coarse cloth and let it stand for twelve hours; then pour off the juice from the sediment, and simmer it to the thickness of molasses; then take out what you wish for syrup, and simmer the remainder to the consistence of tar, and form it into pills. Sweeten the syrup with molasses, and add sufficient spirits to keep it from souring.

Dose—of the pills, from four to six at night, and varied at discretion; and of the syrup, from half to a wineglassful, three or four times a day.

A lady from the western part of New-York came to our infirmary, who was afflicted with a general dibility of the whole system, produced by a confirmed bilious habit. She had also experienced three paralytic shocks, which had affected her left side and eye: her distress at times was excruciating. She had for a few months before coming here employed a very judicious Thomsonian practitioner, who was very faithful in his attend-

ance, having administered to her *eighty-six* courses of medicine, with but temporary relief. We commenced giving her tomato syrup, about a wineglassful three times a day, with the pills at night, and occasionally a few emetic pills. She staid with us two weeks, in that time taking but one course of medicine and one emetic. She left, feeling much better than after taking the eighty-six courses of medicine. This improvement we attribute in a great measure to the active properties of the tomato.

CASSIA MARILANDICA.—Cathartics continued.

American Senna.

AN EFFICIENT AND SAFE CATHARTIC.

CASSIA MARYLANDICA. *Semina—Folia—Caulis.* The seeds, leaves, and stalks.—Somewhat glabrous. The *leaves*, in eight-pairs, lance-oblong, mucronate. *Flowers*, in axillary racemes, and in terminal panicles. *Lugumes*, linear, curved.

It grows along rivers, and on alluvial soil. It is very common in the southern and middle states. It flourishes best on the banks of rivers, and in a low moist soil, yet it is sometimes found on elevated places. It is sometimes cultivated at the north for medical purposes.

In the months of July and August it is in full bloom, and has a beautiful appearance. The leaves, for use, should be collected in August or September, and dried; they are brought into our markets usually compressed into cakes. The leaflets are about two inches long and half an inch wide, very thin, and of a green color. They have a nauseous taste, and feeble odor, somewhat resembling senna.

Medical uses.—American senna is an alterative and safe cathartic, closely resembling the imported kind in its actions, and may be used instead of it in all cases. It is not as active, and to produce an equal operation, must be administered in doses about one third larger. It is habitually used by many as one of the most salutary and efficient cathartics known.

It is most conveniently given in form of infusion, and should combine with it one teaspoonful of ginger, to obviate its tendency to produce griping. The imported senna will answer, when the domestic cannot be obtained.

The best way to prepare it for use is, to take of sage half an ounce, and add it to the same quantity of senna, with a teaspoonful of ginger; steep in a half pint of water for fifteen minutes, then strain, and add sugar and milk, and let half of it be taken as a dose on going to bed.

This is the most valuable medicine to clear and remove distress from the head that I have ever found. (See article, sage.) We mention this article on account of its salutary effects in combination with sage.

OLEUM RACINI.—Cathartics continued.

Castor Oil.

A safe and mild Cathartic, evacuating the bowels without pain.

Racinus Communis.—*Seminum oleum.* The oil of the seeds.

The *palma christa*, or castor oil plant, in Asia and Africa, attains the size of a tree forty or fifty feet high; while in America it is an annual plant. The stem is of vigorous growth, erect, round, hollow, smooth, glaucous, somewhat purplish, towards the top branching, and from three to ten feet high. The leaves are alternate, petiolate, or supported on foot stalks, inserted into the lower disk; palmate, with seven or nine pointed serrate lobes, smooth on both sides, and of a bluish green color. The flowers are monecious, stand on jointed peduncles, and form a pyrimidal terminal raceme of which the lower portion is occupied by the male flower, the upper by the female; both are destitute of corrolla. In the male flower the calyx is divided into five oval, concave, reflected, purplish segments, and enclose numerous stamens which are united into fascicula at the base. In the female the calyx has three or five narrow lanceolate segments, and the ovary which is roundish and three sided, supports three linear, roundish stigmas, forked at their apex. The fruit is a roundish, glaucous capsule, with three pointing sides, covered with three tough spines and divided into three cells, each containing one seed, which is expelled by the bursting of the capsule. This species is cultivated largely in the United States and more especially in New Jersey, Pennsylvania, Maryland, Virginia, and the states bordering on the Ohio river.

The seeds are about the size of a small bean, oval, shining, compressed, and of a greyish ash color, marked with reddish brown spots. If taken internally they will operate powerfully as a cathartic and sometimes as an emetic. Two or three are enough to operate gently and seven or eight will act with great violence.

Medical uses.—The best quality of castor oil is a mild cathartic, speedy in its action, usually attended with little or no griping, and clearing the contents of the bowels, without much increasing the alvine secretions; consequently is very useful in constipation, where there are collections of indurated feces.

From its mucilage it is used with much advantage in costive habits, and is advantageously used in a tea of composition. It may also be given in gin sling with great advantage. When children are much troubled with tough phlegm and difficult respiration, it may be used in the hot sling with the addition of a little cayenne. Its operations carry a lively warmth through the body, much to the relief and comfort of the patient.

In giving courses of medicine, the bowels often become very much constricted or bound ; this will often soothe and remove the obstructions, and thus produce immediate relief, and render the future courses much more efficient. By removing from the body these dry morbid secretions with the use of castor oil, and keeping up the animal warmth so that perspiration may be felt in the palms of the hands, a course of medicine will operate with much less trouble, thereby producing the greatest possible relief to the patient. In a great variety of cases of croup and quinsy in children, by the use of this medicine in connection with the composition, cayenne and emetic, we have succeeded in relieving every case, with little trouble, and to the great satisfaction of all concerned. In the first symptoms of croup, use the oil in hot sling with the addition of a little cayenne, and the relief is almost certain. It carries off all morbid matter from the bowels, and throws life, vigor, and a genial glow to the lower extremities, thereby relieving the head and removing all tendency to *hydrocephalis* or dropsy of the brain. In all attacks of disease in children, great care should be exercised to prevent an excess of circulation to the head. This may always be done by keeping the feet warm and the bowels in a regular state, for which purpose observe our directions in the use of castor oil, to temper the action of the bowels, but judgment should be used in its application. In all cases of danger from mortification, no *cathartic* medicine should be used, neither should *bayberry*, *hemlock*, or *pond lily* be used when there is great constipation of the bowels or costiveness. Judgment is necessary, therefore, in the use of all medicines, without which the most innocent substances can be made instruments to produce disease

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JUGLANS CINERIA.—Cathartics continued.

Butternut. Oil Nut.

CATHARTIC, EMETIC, STIMULANT, DIAPHORETIC, AND EMMENAGOGUE.

Used in colic, flatulency, pain in the stomach, to promote perspiration and remove uterine difficulties.

JUGLANS CINERIA.—*Radicis liber.* The inner bark of the root.

The butternut is an indigenous forest tree, common in the middle, northern, and eastern states. In favorable locations as to soil, it attains a great size of trunk, which often divides into several branches but a few feet from the ground. The top when in the forest, frequently rises to the height of sixty or seventy feet. The male and female flowers are distinct on the same tree. The male flowers are in large aments, four or five inches long, hanging down by the sides of the shoots, of the preceding year's growth. The female flowers are at the end of the shoots of the same spring's growth. The germ is surrounded by two large rose colored stigmas. The nuts are suspended sometimes by a thin pliable peduncle, frequently several are attached to the sides of the same one. The drupe, when ripe, is oblong, brown, and contains a hard, dark brown pointed nut, with a rough and deeply furrowed surface. The kernel is thick, oily, pleasant to the taste, and nutricious.

Medical uses.—Butternut is a mild and stimulating cathartic, operating with little or no irritation, pain, or uneasiness of the bowels, and without weakening the alimentary canal or impairing digestion. The bark taken from the root or body of the tree and boiled down till as thick as tar, may be made into pills, in which form they may be used. Or a syrup may be made by boiling the bark or the buds and twigs, and adding one third molasses and a little W. I. rum. This syrup is good in all complaints of the bowels, and for worms in children. White ash and balm of Gilead bark may be added in equal parts and made into a syrup or pills. By bruising the green bark and applying it to the surface a blister will be raised, and those who may wish this kind of treatment can thus find a cheap article.

RHAMNUS CATHARTICUS.—Cathartics continued.

Buck-Thorn.

BITTER, DIURETIC, EMETIC, AND AN ACTIVE HYDRAGOGUE.

To cleanse the bowels, give tone to the stomach, and for dropsy.

RHAMNUS CATHARTICUS.—*Bacca.* The berries.

The buck-thorn is a middling sized shrub, from ten to twelve feet in height. The leaves are situated on footstalks, ovate, and veined. The flowers are in clusters; small, green, peduncles with a calyx four cleft, and four small petals, placed in the male flower back of the stamens, which are the same in number. The berry is four-seeded. This shrub is a native both of Europe and America, growing wild in the country. It flowers

in May and June, and the fruit is ripe in September, and are about the size of a pea, rounded, somewhat flattened on the summit, smooth, black and shining, with four seeds. Their taste is bitter, acrid and nauseous.

Medical uses.—The berries and expressed juice are actively purgative. They are apt to create nausea and vomiting. In their operation as a cathartic they will create griping pain in the bowels with dryness in the mouth and throat. They are by many considered a good hydragogue cathartic in dropsy, for which purpose alone they should be used. Senna, castor oil, and butternut are far superior to the buck-thorn berries, but they can be used when the other articles cannot be had. This article should not be used in case of a relax, dysentery, or where there are any symptoms of mortification.

For other *Cathartic* substances, see cayenne (capsicum) 590; populus (poplar) 515; bitter root (apocynum) 618, 619; barberry (berberris) 617; peach (amygdalus) 624.

Diuretics.

The articles under this head should strongly commend themselves to all such invalids as are afflicted with *stranguary, gravel*, or *difficulties* of the *kidneys* and *bladder*, also for *dropsy* and *female obstructions.*

FRAGARIA VIRGINIANA.

Wild Strawberry.

DIURETIC, TONIC, DIAPHORETIC, AND ASTRINGENT.

To be used for stranguary, gravel, or difficulties of the kidneys.

Fragaria Virginiana.—*Fructus, Folia, Caulis, Radix.* The fruit, leaves, stalk and root. The *calyx* inferior, ten-cleft, five of the segments alternately smaller. *Petals* five. *Receptacle* of the seed ovate and deciduous, becoming a berry. *Seeds* even.

The *wild strawberry* vines are creeping, herbaceous plants, often sending out filiform radicant stems in all directions, which diminish the quantity of flowers and fruit; leaves ternate very rarely digitate; by cultivation sometimes simple stipules adante to the petioles; flowers terminally corymbose, sometimes dioecous, receptacle esculent.

The wild strawberry is too well known to require a more minute description. It is common in almost every meadow, on high grounds, in pastures, &c., and is known by almost

Galium aparine.

Common clivers.

every person in the country, if for nothing else, for its delicious fruit.

Medical uses.—The strawberry vine and fruit is diuretic, gently astringent, diaphoretic, moderately tonic and stimulant. Its diuretic properties are most prominent and useful. Take a handful of the leaves and the more of the fruit the better and steep in a quart of hot water ten or fifteen minutes; let it set to be used when cold. Let this be used as constant drink in case of gravel or any ulcers or urinary difficulty of the kidneys or bladder. Those afflicted with gravel or stranguary should eat plentifully of the green fruit, or if not in the season of it the dry fruit or preserves. The following preparation should be kept on hand for use in violent attacks of stranguary or difficulty of making water.

A Diuretic Compound.

Fill a jug as full as it can be crowded of the strawberry vines, leaves, roots, and fruit, if any; then pour into the jug as much good Holland gin as it will hold, having added to each gallon of gin two pounds of scalded honey. Let it stand two weeks, and it is a powerful diuretic. Dose from half to a glass three or four times a day.

If you have not a sufficient quantity of the strawberry vines, add with them equal parts of clivers, hemlock boughs, or juniper tops and berries. These articles may be used alone in similar form as the strawberry vines, always remembering to use the clarified honey to sweeten the compound.

GALIUM APARINE.—Diuretics continued.

Clivers—Cleavers.

A POWERFUL DIURETIC, STIMULANT, DIAPHORETIC, AND EMMENAGOGUE.

To be used for stranguary, gravel or dropsy, as prepared. Not to be used in diabetes.

Galium Aparine.—*Semina, Folia, Caulis, Radix.* The seed, leaves, stalk and root. The *stem* limber, scabrous backwards. *Leaves* in about eights, lance-linear, mucronate, hispid above, margin and keel prickly. *Branchlets* nearly simple, about three flowered. *Fruit,* hooked, bristled.

The clivers is an annual plant very common in the United States, growing in cultivated open fields, along fences, by the border of woods, &c. It has a bitter, herbaceous, and somewhat acrid taste, and is destitute of odor. The expressed juice is aperient, diuretic, and antiscorbutic, and has been used in dropsy, scrofula, and scorbutic eruptions.

Medical uses.—The juice has proven useful in scorbutic eruptions, for which two ounces may be taken three times a day. The herb when green, prepared in the form of ointment or infusion, may be usefully applied to scorbutic difficulties or swellings upon the surface. It may be made into a strong tea and be freely used daily as a beverage, by those troubled with calculous ulcers, gravel, or any urinary difficulty. It is also useful in dropsy, as it operates as a hydragogue, a gentle aperient and diuretic; it is also very useful for those who are troubled with costiveness and torpidity of the bowels.

Syrup for Stranguary and Dropsy.

Take of clivers, parsley root, juniper berries, and flax seed, each four ounces; bitter root one ounce; pulverize separately very fine; take three gallons of pure new sweet cider direct from the press, and heat it moderately in a kettle till the scum rises, which remove and then let it boil; put in your pulverized articles and let them boil together for fifteen or twenty minutes, then set it off and add while yet hot two ounces of ginger and four pounds of good boiled honey; when cold put it into a stone jug, and add one quart of the best Holland gin. The ingredient should be preserved with the liquor.

This syrup may be taken from a fourth to a wine glass full at discretion. It is good for all cases of dropsy, gravel, stranguary, or obstructed perspiration, or female obstructions. This article ought to be kept constantly on hand. Its properties are hydragogue, diuretic, stimulant, diaphoretic, and with females emmenagogue. Not to be used in diabetes.

LACTUCA ELONGATA.—Diuretics continued.

Wild Lettuce.

DIURETIC, ANTISCORBUTIC, MODERATELY ANTISPASMODIC, DIAPHORETIC, AND NARCOTIC.

For complaints of the kidneys and bladder, dropsy, scorbutic difficulties, and constipation of the bowels.

Lactuca Elongata. *Herba.* The herb.—*Receptacle*, naked. *Calyx*, imbricated, cylindrical, with a membranous margin. *Pappus*, simple, stipitate.

The *wild lettuce* is an indigenous, biennial evergreen, with a slender stem, and leaves from the size of a cent to that of a dollar, and much resembling the common lettuce. It grows in deep shady woods, and may generally be found in the same kind of soil and locations as pipsissewa. The leaves, when

wounded, exude a milky juice, in which the virtues of the plant consist.

Medical uses.—The juice is a sedative, narcotic, and generally laxative, powerfully diuretic, and slightly diaphoretic. It is an excellent remedy for the universal dropsy, operating as a powerful hydragogue, if compounded with bitter root, in proportion of four ounces of the green lettuce to one of bitter root, pulverized and infused in half a gallon of spring water; adding Holland gin sufficient to prevent its souring.

This tea may be taken clear, or made palatable with milk and sugar. Take a glass from three to six times a day, or till it operates powerfully as a cathartic.

The roots of the lettuce may be dried, and pulverized with equal quantities of pipsissewa, and used, a teaspoonful of the mixture in a glass of hot water three times a day. This is good for all scorbutic complaints, or bad humors of the blood. Simmered in lard or fresh butter, it is good for old sores and ulcers, and by adding a quantity of cayenne while simmering, it makes an excellent ointment for rheumatic pains, stiff neck, croup, the quinsy, sprains, and swellings of any kind about the joints.

APIUM PETROSELINUM.—Diuretics continued.

Parsley.

DIURETIC, APERIENT, AROMATIC, CARMINATIVE, AND SLIGHTLY STIMULANT.

For dropsy, gravel, and obstruction of the liver and kidneys.

Apium Petroselinum.—*Folia*, *Radix*. The leaves and root.

This plant has a round, branching, annual stem, with a biennial root, which rises about two feet. The plant contains an essential oil, to which it owes its medical virtues, as well as its use in culinary purposes. The seed, herb and root, are all possessed of strong diuretic properties, and have an aromatic taste.

The root is long and slender, white externally, and marked with close wrinkles; internally white and fleshy, the pith yellowish. It has a sweetish, aromatic taste, is slightly bitter and tonic. The green plant should be used for medical purposes.

Medical uses.—The whole plant is powerfully diuretic, and gently aperient; useful in nephritic difficulties, and dropsical habits. It may be used in the form of infusion, or compounded with bitter root and golden seal, with the addition of spirits to preserve it, when it makes an excellent bitter.

A COMPOUND SYRUP.

Take of parsley roots, tops and seeds, half a pound, the same quantity of dandelion roots and herb; of juniper berries a fourth of a pound, and of bitter root one ounce; pulverize all the articles well together, and boil in two gallons of water down to six quarts; strain off, and press the grains, then add one quart of Holland gin, one gallon of fresh new cider as soon as it has fermented, three pounds of boiled honey, two ounces of good ginger, and two ounces of prickly ash seeds. Stop it tight in a stone jug, and shake it three or four times a day for a week, and it is fit for use.

For difficulties of the kidneys or bladder, or dropsy, and cold feet and hands, or irregularities in the menstrual discharges, and for constipation of the bowels, this will prove a valuable article, whenever used.

LEONTODON TARAXACUM.—Diuretics continued.

Dandelion.

DIURETIC, TONIC, APERIENT, AND HYDRAGOGUE.

For dropsy—to correct the liver and digestive organs.

Leontodon Taraxacum. *Folia*, *Radix*. The leaves and root. *Calyx*, double. *Receptacle*, naked. *Pappus*, stipitate, plumose. *Scape*, one-flowered. *Leaves*, runcinate.

This plant is naturalized, and is a genus of five species indigenous to Europe.

The *leontodon* is a perennial, herbaceous plant, with a fusiform root. The leaves are long, pinnatifid, runcinate, with toothed divisions, smooth, and of a dark green color. The flower stem rises six or eight inches high, or more, from the midst of the leaves. It is naked, erect, simple, smooth and hollow, and terminates by a large yellow flower, which closes at night and expands in the morning. The calx is double, smooth, with the outer scales bent downwards. The florets are ligulate, numerous and toothed at their extremities. The Receptacle is punctate and convex. The seed-down stipitate and at maturity is so light and feathery as to be easily blown away with the least breath of air with the seeds attached, and is thus transplanted from one soil to another. The plant has a milky, bitterish juice, diffused throughout all its parts which exudes when it is wounded. When very young the leaves are blanched or beautifully white. A full grown and fresh root is frequently more than a foot long and as thick as the little finger.

slender, round and tapering, full of a milky, bitterish juice, of a brown color outwardly, but white within, having a cord running through the centre. When dry, it is much wrinkled, shrunk and brittle, and on being broken presents a shining, resinous fracture. It has a sweetish-bitter, herbaceous taste. It yields its medical properties to boiling water.

Medical uses.—The dandelion is diuretic, tonic, and aperient, and has a direct action upon the liver and kidneys, exciting them, when languid, to action. It is most applicable to hepatic diseases, and derangement of the digestive organs generally. In chronic inflammation of the liver and spleen, in cases of deficient biliary secretions, and in dropsical affections of the abdominal viscera, it is capable of being very beneficial, if properly applied. From experience we can speak decidedly in its favor. It is usually given in the form of extract, decoction, or syrup.

Four ounces of the green root, or two of the dry, may be boiled in a quart of water, down to a pint, and a wineglassful be given six or eight times a day.

Syrup of Dandelions.—*For Dropsy or Stranguary.*

Take of fresh gathered dandelions, root and top, one pound, (or if dry, two pounds,) of dwarf elder, green, two pounds, (or if dry, a pound and a half,) one pound each of green strawberry and peach leaves, of green parsley, root and top, half a pound; bruise all these articles thoroughly, and put them into four gallons of water, and simmer them down to three. Strain off and sweeten with good sugar, put it into a clean kettle and simmer till the scum rises and then remove it. Then take half a pound of pumpkin seeds, three fourths of a pound of water melon seeds, four ounces of juniper berries, and two ounces of bitter root; pulverize fine and add them to the syrup when it commences to boil, which it should continue to do for about five minutes after they are added; then set off, skim it, and add one gallon of the best Holland gin.

Dose, from a fourth to a glass, several times a day.

If this does not start the water, it is doubtful whether any thing will. It is a powerful hydragogue, diuretic, diaphoretic, and moderately stimulant. It will operate more effectually, if the patient be in bed, and perspiration excited by taking stimulants, and by having at the feet a steaming stone or jug of hot water. While under this operation, great care should be taken to prevent catching cold.

JUNIPERUS COMMUNIS.—Diuretics continued.

Juniper.

DIURETIC, ANTISCORBUTIC, SLIGHTLY STIMULANT, AND TONIC.

For all difficulties of the kidneys, stranguary, gravel, calculus, and dropsy.

JUNIPERUS COMMUNIS. *Bacca*—the berries. *Leaves*, in threes, spreading, macronate, longer than the berry.

The *juniper* is an evergreen shrub, usually small, but often attaining to the height of ten or twelve feet, with numerous and spreading branches. The leaves are small and narrow, much longer than the fruit, sharply pointed, of a deep green color, spreading, and attached to the branches in threes. It has a globular berry, formed of the fleshy scales of the aments, and has three angular seeds.

The shrub is indiginous, and grows in New Jersey, from whence the berries are brought to market, but are not as strong as those brought from France and Italy. The berries impart their virtues to water and alcohol, and are much used by distillers in making Holland gin.

Medical uses.—The berries are the only part of the tree used as medicine, and are a stimulant and diuretic. When extensively used, it creates a disagreeable sense of irritation in the urinary passages. The berries are used to assist more powerful diuretics in cases of dropsy. They have also been used in scorbutic and cutaneous diseases, and as a tonic in correcting digestion. Juniper may be taken in infusion. Bruise two ounces, and put it into a quart of boiling water and steep it for half an hour; when cool, make it a constant drink, unless bad effects should result from its excessive use; which will be felt, if any, in the urethra or urinary passages.

A STRONG DIURETIC SYRUP.

Take of juniper berries, poplar bark, and water melon or pumpkin seeds, each half a pound, hemlock boughs one pound; bruise all the articles together, and boil them in two gallons of pure new cider for half an hour; strain off, and sweeten with boiled honey; then add half a pound of green roots of horse-radish, half a pound of pulverized mustard seed, and half a gallon of best Holland gin. Let it stand in a stone jug for two or three days, being often shaken, when it is fit for use.

Dose, a glass two or three times a day, or at discretion. It will start an active circulation and perspiration through the whole body, and its diuretic properties will operate admirably in all cases of dropsy, stranguary, gravel, and irregular menstruation.

For a Beer—Put the five ingredients first mentioned in the foregoing preparation into four gallons of water, steep for two hours, strain off and press out the liquor, sweeten with molasses, and when blood warm add half a pint of yeast. Let it work thoroughly, and it is a valuable drink to be used in all difficulties for which the preceding compound is recommended. The horse-radish and mustard may be added at the time when the yeast is, if convenient.

NOTE.—*Hemlock boughs* and *poplar bark* possess strong diuretic properties, and may be used when the other articles cannot be had. [See pages 599 and 615.]

Mucilaginous Substances,

FOR CATAPLASMS, OR POULTICES—VALUABLE REMEDIES.

CHEREVISIÆ FERMENTUM.

Yeast.

ANTISEPTIC, DEMULCENT, MUCILAGINOUS, AND STIMULANT.

To be used as a cataplasm upon all inflammatory sores, bruises and sprains, and to prevent mortification.

Yeast is a frothy substance, made of hops by bakers to raise their sponge previous to baking, and by brewers for the fermentation of beer. It rises with a white frothy appearance on the top of beer, and is also produced by vinous fermentation.

Medical uses.—Brewers' yeast has been highly applauded as a remedy for mortification, on account of its antiseptic properties. It has been successfully employed in contagious diseases, in yellow, bilious, spotted and typhus fevers, and all other febrile complaints attended with putrefaction. In cases of high febrile excitement, a yeast poultice is often beneficial, if applied to the bowels. It may also be used in cases of fractured limbs, sprained joints, and putrid sores and ulcers, to great advantage. In cases of broken limbs or sprained joints, where the inflammation is high, it exerts a very soothing effect: for which purpose spread a poultice and apply it completely around the injured part, and the pain will very soon be relieved. As a poultice, it may be combined with sponge crackers or slippery elm.

Yeast may be taken for the dysentery, to the amount of two or three ounces hourly, mixed with a little cayenne, when the bowels are in a putrid state, by doing which, and placing a poultice on the patient's bowels, many lives have been saved.

This is a remedy that should be remembered by every family.

Fresh yeast may be mixed with charcoal pulverized and applied to putrid sores, or may be taken inwardly, when there is danger of mortification either in body or limb.

ULMUS FULVA.

Slippery Elm—Red Elm.

EMOLLIENT, TONIC, DEMULCENT, AND NUTRITIOUS.

Internally for dysentery, &c., externally for inflammation.

Ulmus Fulva. *Liber*—the inner bark. The *branches*, scabrous, whitish. *Leaves* ovate-oblong, acuminate, nearly equal at the base, unequally serrate, pubescent both sides, very scabrous. *Buds* tomentose, with very dense yellowish wool. *Flowers* sessile. It may always be known by chewing the bark, which is very mucilaginous.

The *slippery elm* is a lofty tree, from fifty to one hundred feet high, and a native of the American forest. It is often found in the northern states, but flourishes best west of the Alleghany mountains. The inner bark is whitish, and is the only part used as medicine.

Medical uses.—Slippery elm bark is an excellent mucilaginous substance, applicable in all cases where this class of medicines may be used. It is a valuable article in dysentery, diarrhœa, and diseases of the urinary passages. It has been employed in leprous and herpetic eruptions, probably from its great demulcent properties. It is highly nutritious, and we are told that people have actually subsisted on it for some time, without any other food.

The inner bark shonld be carefully and thoroughly dried, and pulverized as fine as wheat flour. If for internal use, mix a teaspoonful of it with as much sugar, add a little cold water and stir them well together, and then add hot water enough to reduce it to the desired consistency. This is an excellent remedy for putrid sore throat, after having used No. 3, to clear away the canker. The elm sooths the sores, and produces a comfortable sensation.

Make it of a sufficient thinness, and it is one of the best of drinks to be used constantly by the sick.

Slippery elm is much used in the Thomsonian practice for poultices, for which purpose it has not its eqnal.

POULTICES.

Pnt one tablespoonful of fine ginger into half a pint of hot water, then stir in Boston or sponge crackers that have been

Ulmus fulva.

Slippery elm.

rolled or pounded fine till it is about as thick as molasses; then stir in gradually a teaspoonful of fine slippery elm, and if this does not make it thick enough, add more of the crackers. If it is to be used in a high state of inflammation, add two tablespoonfuls of soft soap and one of fine salt.

This poultice should be kept moist by occasionally adding a teaspoonful of warm water on the outside, for if the inflammation is so high as to dry the poultice the pain will increase.

Leaving out the soap and salt, and using milk instead of water, it is one of the best of poultices to be applied to burns, felons and old sores, as it will ease the pain almost immediately. The poultice prepared as last mentioned, with the addition of a little of the pulverized root of yellow lily, is an excellent application to draw out the pain from all kinds of ulcerations, mercurial and venereal sores, and will allay inflammation and irritation at once. It is the best application for a swelled or caked breast; in which case let the liquor be brewers' yeast, first putting the lily root and slippery elm into a little hot water, to extract the strength, and then into the yeast, after which add the crackers and ginger.

A poultice ought to be changed as often as once in twelve hours, or oftener if there is much inflammation. Let them always be kept moist by the application of hot water or milk and water. By this course the inflammation will be soon reduced.

This poultice should be remembered in all cases of burns, scalds and freezing, as it affords relief immediately on its application.

OSMUNDA REGALIS.

Buck-Horn Brake.

MUCILAGINOUS AND TONIC.

For dysentery, or any soreness of the intestinal canal.

Osmunda Regalis.—*Radix*—the root. *Frond* bipinnate, terminating in several racemes, very branching, and without hairs. It grows on damp ground and meadows. The main root is in shape of a horn, about two inches long.

Medical uses.—The root of the buck horn brake is a valuable article in dysentery, or a sore, tender state of the stomach and bowels. Steeped in hot water and sweetened with loaf sugar, with the addition of Holland gin sufficient to preserve it, it makes an excellent article to be used in the cases above mentioned, and is also good for female weaknesses and general debility.

Mucilaginous Syrup, for Weakly Females.

Take the piths of the roots of buck-horn brake, bruised; put them into a stone pot and add water, either cold or hot; beat with a spoon until it is of the consistence of the white of an egg. Pour off, and to one gallon add two pounds of white sugar, one quart best brandy, two ounces of pulverized caraway seed, and one glass of the volatile tincture.

Use.—For weak, nervous patients, or women in child bed.

SESIMUM ORIENTALE.

Benne Plant.

MUCILAGINOUS, TONIC, AND EMOLIENT.

For dysentery, disordered bowels with children when teething—in poultices, for burns, frozen limbs, whitlows, biles, old sores of any kind, and good to allay inflammation.

SESIMUM ORIENTALE. *Folia, Oleum Seminum*—the leaves, and oil of the seeds.

The *benne plant* of the United States is a branching, annual plant, from four to five feet high, having opposite petiolate leaves, varying in their shape considerably. Its flowers are reddish white, and stand upon short peduncles near the insertion on the angle of the leaves with the stalk. It grows principally in the southern states. The seeds are parched by the negroes, and used as food.

Medical uses.—The seeds and leaves yield a fixed oil, of a mucilaginous nature, which is very useful in all diseases of the bowels. It has a sweetish taste, is inodorous, and somewhat resembles fresh sweet oil, and may be used as a substitute for it in all cases. It is an excellent article to soften the skin, to remove cracks from the hands or any part of the body, and for chafes, especially with children.

The leaves possess an abundance of gummy matter, which they readily impart to water, forming a very rich mucilage, which is much used as a drink at the south in complaints where demulcents are useful, such as cholera infantum, catarrh, diarrhœa, dysentery, and all difficulties of the kidneys and urinary passages.

Two of the leaves, beat rapidly in half a pint of cold water, make it very mucilaginous, in which way it is usually prepared for internal use. If the leaves are dry, they must be put into hot water.

The pulverized leaves, with the addition of sponge crackers and a little ginger, wet with warm water, make an excellent poultice for burns, and all kinds of inflammatory sores.

ALTHÆA ROSEA.

Hollyhock.

MUCILAGINOUS.

In poultices—or internally as a demulcent

ALTHÆA ROSEA. *Flores*—the flowers. The *stem* erect. *Leaves* rough, heart-form, five to seven-angled, crenate.

This plant is cultivated in gardens for its beauty, as well as medical properties.

Medical uses.—A tea of the hollyhock flowers may be employed in inflammation of the mucous membrane or soreness of any part of the alimentary canal. It also forms the mucilaginous part of the conserve of hollyhock, or bread of life. The leaves pulverized may be substituted for slippery elm in poultices.

TRIFOLIUM PRATENSE.

Red Clover.

DISCUTIENT, STIMULANT, AND DEMULCENT.

For cancers, and other scorbutic difficulties.

TRIFOLIUM PRATENSE. *Flores*, *Folia*—the flowers and leaves. *Stalk* ascending, smoothish. *Leaflets* ovate, sub-entire. *Stipules* awned. *Spikes* dense, ovate. Lower tooth of the *calyx* shorter than the tube of the corol, and longer than the other teeth. It is too well known to need a further description.

CANCER PLASTER.

Take a brass kettle that will hold eighteen or twenty gallons and fill it with the heads of red clover, pressed close together, with some heavy substance on the top to keep them down, and pour in water till the clover is covered. Boil it one hour over a lively fire, then strain off, and press out all the liquor from the clover. Fill the kettle again with fresh clover, boil in the liquor that was obtained from the first boiling, for the same length of time, and strain off as before, then simmer it over a slow fire till it is about the consistence of tar, when it is fit for use. Great care should be taken not to burn it, as that destroys in a great measure its virtues.

Medical use.—This salve is adhesive, emollient, and antistyptic, good for old sores, cancers, sore lips, &c. When used, it should be spread upon a piece of split bladder, or on the membranous covering of suet, lard, or tallow.

ARUM TRIPHILLUM.

Wild Turnip—Wake Robin.

MUCILAGINOUS, EXPECTORANT, STIMULANT, AND ANTISPASMODIC.

For all difficulties of the lungs, asthma, raising blood, bronchial affections of the throat, or of the mucous membrane.

Arum Triphillum. *Radix*—the root.

The *wild turnip* has a tuberous perennial root, which sends up in the spring a large colored spathe, flattened and bent at the top like a hood, and supported by an erect, purplish scape. The spathe has within it a club-shaped spadix, variegated, round at the end. At the base it is surrounded by the stamens, the female organs being below the male. The spathe, spadix, and germs, are converted into a bunch of scarlet berries. The leaves stand on long sheathing foot-stalks, and are composed of leaflets, paler beneath than on their upper surface, and in time becoming glaucous.

There are several varieties of the arum, known by the different color of the spathe, which in one is white, in another dark purple, and in a third green. This plant is a native of the United States, growing in swamps, along ditches, and in shady places. All parts of the plant are stimulating, but the root is the only part used as medicine. The root is roundish, and flattened at the top and bottom, and is covered with a loose, wrinkled, blackish epidermis. Internally it is white and solid.

The fresh root has a slight odor and is very stimulating, creating when chewed a burning sensation in the throat and mouth, which lasts for some time, and leaves a sense of soreness. The stimulating quality of the root is extremely volatile, and is entirely destroyed by heat. The root becomes in a great measure inert when dried. It may be preserved for medical use, fresh for a year, if buried in dry earth or sand.

Medical uses.—The wild turnip in its fresh state is a powerful stimulant and local irritant, possessing the power of stimulating the secretions of the lungs and skin. It is an excellent thing for, pain in the bowels and colic.

Its pectoral properties have proved highly beneficial in coughs, consumptions of the lungs and asthma, for which we have used it for more than forty years. The root should be dried, pulverized, and used as directed under the head of cough powders, or it may be given in honey, in the syrup of preserves, or in any other saccharine matter, or it may be made into a paste with honey or syrup, and used in form of candy, by letting the substance dissolve gradually on the tongue, so as to diffuse its warmth through the mouth, and thus used is good for apthous sore mouth and throat.

VALUABLE COUGH DROPS.

Take six ounces of dried wild turnip, well pulverized, stir it into one pint of cold water, infuse it till the knobs, or small accumulations of the powders, are well mingled with the water, then pour on half a gallon of boiling water, and a heaped teaspoonful of fine cayenne pepper, half a gallon of molasses, half a gallon of Jamaica rum, one pint of the tincture of lobelia and the juice of half a dozen best Sicily lemons.

This is a very valuable article for coughs, raising of blood, asthma, croup, or any difficulty of the lungs.

A small vial of these drops should be carried by those who are affected with a cough, and about half a teaspoonful taken at a time whenever there is an irritation in the throat, or an inclination to cough. This will keep the throat and lungs under a continual stimulation or excitement, by which means expectoration will become easy. It will also relieve pain in the side and breast, or colic pains; and is a valuable remedy for many other complaints of the chest besides coughs.

Powerful Aromatics and Tonics.

The following articles are some of the most powerful aromatic, astringent, and tonic substances, combined in the same article, with which we are acquainted. They are valuable remedies for a great variety of diseases, such as female weaknesses, and for weak and debilitated patients, when stomachic and tonic remedies alone are wanted to give action and strength to the digestive system, and speedy and permanent health to the body. In all cases where the disease has not reached its crisis, aromatic, astringent or tonic remedies, should be used but moderately, in form of syrups or cordials, to give strength to the system, as they are liable to increase and aggravate the disease if given freely. *This should be remembered by the practitioner.*

EUGENIA CARYOPHYLLATA.

Clove Tree.

This is the name of the tree that produces the clove. It grows in the East Indies and the Molucca islands. The clove, which is the calyx, has a strong, agreeable smell, and a bitterish, hot taste. Cloves are the most powerful of all aromatics.

Medical uses.—Cloves may be used with other articles, not only to cover a disagreeable taste, but by their heating nature are in many cases very serviceable. They are usually em-

ployed in preparing the composition powders. They may be used to advantage in fever and ague. They will usually relieve the toothache, by applying a little of the oil on cotton, or by chewing a clove, and keeping it by the affected tooth.

MYRISTICA MOSCHATA.

Nutmeg Tree.

This is the tree which produces the nutmeg and the mace. The tree grows in the East Indies.

The nutmeg, *myristicæ nucleus*, is aromatic, anodyne, stomachic, and astringent.

Medical uses.—Nutmegs may be used in diarrhœa and dysentery, where their astringent property often renders them serviceable. They may also be employed in all cass where any of the aromatics are useful, and are most beneficial in syrups for patients who are weakly.

MACE,

Is the middle bark of the nutmeg. When dried, it is of a lively yellow reddish color; its qualities are nearly the same as those of the nutmeg, but it is less astringent. It may be boiled in milk, and is very useful for patients who are weak and debilitated.

Medical uses.—Mace may be used instead of nutmeg, and is to most people more agreeable.

MYRTUS PIMENTA.

Allspice Tree.

The fruit of the spice tree is moderately warm, of an agreeable flavor, much resembling that of a mixture of cloves, cinnamon and nutmegs.

Medical uses.—Allspice may be compounded with bitters and powders, to give them an agreeable taste. It is also slightly a stomachic.

Boiled in milk, it is good for children with the bowel complaint while teething, also for relax and dysentery, and for weakly females, if it is made into syrup.

LAURUS CINNAMOMUM.

Cinnamon.

This is the name of the tree which affords the cinnamon bark. Cinnamon bark is one of the most grateful of the aromatics. It has a moderately pungent taste, accompanied with a considerable degree of sweetness.

Medical uses.—Cinnamon is a good cordial, carminative and restorative, useful to be mixed with the diet of the sick. It is also good to compound in spice bitters, &c., and will check vomiting, and sickness at the stomach. It may be used in substance, pulverized, in decoction, or in form of essence. Like the preceding articles, the cinnamon is good for diarrhœa and dysentery, either compounded in syrup, boiled in milk, made into a tea, or chewed in substance.

A VALUABLE AND POWERFUL

AROMATIC COMPOUND,

For Weak, Debilitated Patients, either Male or Female.

Take of cloves, nutmegs, unicorn root, and golden seal, each two ounces; of mace, allspice, cinnamon, gum arabic, and red oak acorns, divested of their shells, each four ounces, cayenne pepper half an ounce; pulverize them all very fine together, then put them into two quarts of boiling water, simmer and stir them well together; then add half a gallon of good Jamaica rum, one gallon of good port wine, four pounds of loaf sugar, and two pounds of buck-horn brake and one pound of green comfrey, both well cleansed and pulverized; put these articles all into a jug together, stop it tight, and let it be shaken two or three times a day for a week.

Take from a tablespoonful to half a glass. Females cannot find an equal to this powerful aromatic tonic, for weakness of the back, side or stomach.

Be careful of the strength of this remedy. It may be too powerful for many who are very weakly; in such cases commence with half a tablespoonful, and increase the quantity as the patient can bear it. For fluor albus, or any other female weakness, this remedy is unrivalled.

Note.—If this compound is found to be too strong, add one quart more of Jamaica rum, and half a gallon of port wine. The strength may thus be increased or diminished, to suit the circumstances of the case.

Balsams.

PINUS BALSAMEA.

Fir Tree—Balsam Tree.

BALSAMIC AND HEALING.

For coughs, affections of the lungs, and both internal and external soreness.

Pinus Balsamea.—*Leaves* flat, emarginate or entire, glacous beneath, sub-erect above, recurve-spreading. *Cones* cylindric, erect. *Bracts* abbreviated, obovate, long-mucronate, sub-serrulate.

The fir tree grows wild in the American forests, preferring damp cold swamps.

Medical uses.—The balsam fir is a transparent liquid, which collects in blisters on the trunk and branches. It has a pleasant odor, and is slightly bitter. It may be profitably employed as a plaster on wounds or cuts, as it is very healing. A decoction of the bark or the balsam may be used in all cases of internal soreness, such as dysentery and affections of the lungs. It is peculiarly serviceable in cholera infantum, and is one of the principal ingredients of the yellow salve.

COPAIFERÆ OFFICINALIS.

Balsam Copaiva.

This is the name of a tree growing in Brazil, from which the balsam of copaiva is obtained. When fresh, this balsam is a colorless fluid, but in time it acquires a yellowish tinge. It is of an agreeable smell, and bitterish biting taste, which is very permanent on the tongue.

Medical uses.—This msy be used for the same purposes as the fir balsam, but is not as good. It has been much employed in the venereal, and in diseases of the urinary organs.

For a dose, take from six drops to a teaspoonful.

Antacids.

FOR SOUR STOMACH OR HEARTBURN.

The articles under this head should commend themselves to all persons that are troubled with a deranged state of the stomach and digsstive organs; and especially to high livers and epicures who gratify their *taste* rather than the *convenience* of the stomach and organs of digestion. The consequences are a sour stomach, flatulency, dyspeptic affections, gout, corpulency, arterial and nervous irritability; all of which are produced for the want of order and regularity with regard to diet, rest and exercise.

The following articles are used in the Thompsonian practice to correct acidities of the stomach, and facilitate the operation of emetics, while giving courses of medicine.

SODÆ CARBONAS.

Carbonate of Soda.

This article is obtained several ways, but principally from plants growing on the seacoast. It is procured by lixiviation from the ashes of the burnt plants. None but those that grow on the sea shore can produce it. The alkali thus produced is more or less pure, according to the nature of the plant from which it is obtained. But the greater part of it is a *sub carbonate of soda.*

To procure pure soda, make a solution of the pure carbonate and boil it with half its weight of pure lime, and after it has subsided pour off the pure lye and evaporate it in a clear iron or silver vessel till the liquid flows quietly like oil; then pour it upon a polished iron plate, and it concretes into a hard white cake, which must be immediately broken in pieces and corked tight in bottles.

Carbonate of soda is a white salt, of a disagreeable alkaline taste. It dissolves very readily in water, but is nearly insoluble in alcohol. It is incompatible with acids, and earthy and metalic salts.

Medical uses.—Carbonate of soda is an antacid and resolvent; useful in diseases which cause acidity of the stomach, such as dyspepsia, gout, or any other affection produced by irregulariry or intemperance in eating.

It may be given in form of powder or solution. Dose; the powder may be given in doses of from a fourth to half a teaspoonful and the solution in about three times the quantity.

MAGNESIÆ.

Magnesia.

Pure magnesia is a very light, white, inodorous powder, of a feeble alkaline taste.

Carbonate of Magnesia sometimes occurs as a native mineral, but is more usually manufactured. It can be produced from the bittern of salt works.

To make pure magnesia: expose carbonate of magnesia in an earthen vessel to a red heat, for two hours, or till the addition of vinegar will produce no effervescence.

Medical uses.—Magnesia may be employed as an antacid and laxative, in dyspepsy, sick headache, gout, and all complaints accompanied with sourness of the stomach or costiveness of the bowels.

It is given in form of powders. Dose, from ten grains to a teaspoonful. This remedy is very useful for females in uterogestation, to correct the acidity of the stomach attendant upon such a state, and has a tendency to keep the bowels regular from its gently laxative properties.

POTASSÆ CARBONAS IMPURUS.

Pearlash, or impure Carbonate of Potassa.

Pearlash is of a white color usually tinged with blue. It has a burning alkaline taste but no smell. It is soluble in water.

Pearl and potashes are procured from wood by lixiviation and subsequent evaporation.

Medical uses.—A solution of pearlash may be used instead of any of the other alkalies, but is more corrosive. It may be prepared for use similar to lime, and taken in about half the quantity, or let the strength be reduced to the ability of the stomach to bear it.

POTASSÆ BICARBONAS.

Salæratus, or Bicarbonate of Potassa.

This article is the same as the preceding one, only reduced to a greater degree of purity.

It is usually in the form of white chrystals, having the form of flat irregular prisms. It is perfectly inodorous. It is soluble in water but not in alcohol.

Medical uses.—It may be given in solution, formed by adding to it four times its bulk of cold water, for acidities of the stomach and in all cases where any of the alkalies are recommended. Dose, from a tea to a table spoonful.

CALX.

Lime.

Lime is a colorless substance, inodorous, and of a disagreeable alkaline taste. It may be prepared in the following manner: Take of limestone, (Carara marble,) or oyster shells well cleansed in hot water, any desired quantity; pulverize

and heat in a crucible over a hot fire for one hour or till the carbonic acid is entirely driven off, which may be known by the addition of a little acetic acid; if no bubbles of gas pass off it is sufficiently heated.

To form lime into a solution for use: add one ounce of lime to one quart of pure soft water, stir them well together, cover the vessel and let it stand for three hours. Keep the solution together with the undissolved lime, in a bottle closely corked from the air.

Lime water is antacid, tonic, and astringent.

Medical uses.—It is useful in acidity of the stomach, diarrhœa, and in some cases of the gravel. By giving it in milk its disagreeable taste is entirely covered. It is an excellent wash in case of scald head or any other putrid or ulcerous sores.

Dose, from one to three tablespoonsful.

Important to be remembered.

N. B.—If at any time any of these alkalies should be taken by accident or design, in such strength as to create great distress in the stomach, they can be neutralized in a moment by taking a small draught of vinegar or cider. Those in the habit of using them should always keep in mind this corrective principle.

CAUSTICS.

AND THEIR INFLUENCE UPON FEVER SORES AND INFLAMMATORY SWELLINGS GENERALLY.

In the treatment of boils, felons, whitlows, or any inflammatory gathering, where, on account of its being deeply seated or the firm texture of the skin, the matter is with difficulty brought to the surface, caustics are often servicable; but instead of using corrosive or poisonous substances, a little punk or slow match, the size of a pea, if burnt upon the centre of the diseased place, answers every purpose; after which apply a softening poultice to ease the pain and promote suppuration. The method of performing this operation is as follows: Take several pieces of cloth, wet with cold water, bits of an old hat, or something of the like, let a hole be cut through them the size of the puncture you wish to make, and apply them to the affected part; then fill the hole with a piece of punk and set fire to it. If once burning does not make the puncture deep enough, repeat it till it does. Then apply a poultice and the relief is certain and almost immediate. This is the safest and mildest caustic that is in use. *Warts* may also be cured in the same way.

The indications that show the necessity of this treatment are an excessive distress, extension and high inflammation and a want of perspiration in the diseased parts. In all gatherings of an inflammatory nature where the matter escapes with difficulty to the surface, we can testify to the beneficial results arising from the use of this caustic, followed by the application of a softening poultice, from our own experience, having employed the same treatment on ourself in case of a fever sore.

N. B. Before applying this caustic let a cord or handkerchief be tied very tightly around the limb on both sides of the sore, to prevent as much as possible the pain from being communicated beyond where the application is made. By so doing it causes but little pain.

Simple Substances.

Having thus far given the most important articles in our practice, we subjoin some simple remedies, which may be profitably used in many cases, and which may be substituted for the more important ones when they cannot be obtained.

Simple Emetics.

VERBENA HASTATA.

Blue and White Vervain.

SLIGHT EMETIC, BITTER TONIC, AND COUNTER POISON.

For an emetic, in decoction. For poison, boiled in milk.

VERBENA HASTATA. *Herba*—the herb.

Erect, tall. *Leaves* lanceolate, acuminate, gash-serrate; lower ones sometimes gash-hastate. *Spikes* linear, panicled, subimbricated.

This herb grows very common in neglected fields, pastures, &c.

Medical uses.—Vervain is good as an emetic, and in that respect ranks next to lobelia. The two may be mixed, or the vervain may be used alone when lobelia cannot be had. Many bad cases of consumption have been cured by this article. It is also a good counter poison.

EUPATORIUM PERFOLIATUM.—Emetics continued.

Thoroughwort—Boneset.

MILDLY EMETIC, SUDORIFIC, TONIC, AND EXPECTORANT.

For coughs, and other complaints of the lungs.

Eupatorium Perfoliatum. *Herba*—the herb. *Leaves* connate-perfoliate, oblong-serrate, rugose, downy beneath. *Stem* villose. About three feet high.

Thoroughwort is a very common herb, growing usually near some stagnant pool or running stream of water.

Medical uses.—Taken in form of hot decoction, it operates as an emetic, sudorific, and expectorant. In order to induce vomiting, it must be given in copious draughts. It is good in complaints of the lungs, to be used as a common drink. A decoction of boneset, taken cold in repeated small doses, will operate as a cathartic.

SANGUINARIA CANADENSIS.—Emetics continued.

Blood-Root.

EMETIC, EXPECTORANT, AND EMMENAGOGUE.

For coughs, influenza, consumptions, and female obstructions.

Sanguinaria Canadensis. *Radix*—the root. *Leaves* sub-reniform, sinuate-lobed. *Scape* one-flowered. A variety, *stenopetala*, has linear petals.

Blood-root grows common in this part of the country. Its most favorable location is on the borders of pine or hemlock woods.

Medical uses.—Blood-root will answer as an emetic, when lobelia cannot be had. It may be used in tincture, or in substance, pulverized. The tincture, in teaspoonful doses once in three or four hours, is a good expectorant. If it is desired to operate as an emetic, give it in repeated small doses at intervals of about twenty minutes, till it creates nausea. In large doses it exerts a powerful influence over the uterus, and has been employed in obstructed and deficient menstruation. In uterogestation, if employed at all, let it be with great caution.

Note.—Blood-root taken in form of snuff will often cure polypus in the nose; and when they have been extracted, if used freely, it will generally prevent them from growing again.

Simple Stimulants.

The following articles may be used when No. 2 cannot be had, in giving courses of medicine.

MENTHA VIRIDIS.

Spearmint.

STIMULANT, AROMATIC, ANTISPASMODIC, TONIC, AND ASTRINGENT.

In decoction, to promote perspiration and ease pain.

Mentha Viridis. *Herba*—the herb. *Spikes* oblong, interrupted. *Leaves* lanceolate, naked, serrate, sessile. *Stamens* longer than the corol.

Spearmint grows in low, damp places, and by the side of brooks.

Medical uses.—The whole herb may be cut when in full bloom, and dried, to be used freely as a pleasant drink in any case of sickness. Take it in a warm decoction. It expels wind from the stomach, and promotes perspiration. It is an excellent article to settle the stomach, and stop vomiting. If after taking an emetic violent vomiting continues or if it is caused by any other means, a strong tea of this herb will usually stop it.

MENTHA PIPERITA.—Stimulants continued.

Peppermint.

STIMULANT, AROMATIC, WARM, AND SLIGHTLY BITTER.

To be employed much the same as spearmint.

Mentha Piperita. *Herba*—the herb. *Spikes* obtuse, interrupted below. *Leaves* sub-ovate, somewhat glabrous, petioled. *Stem* glabrous at the base.

Peppermint is usually found along running streams of water. It is very odorous, and of a warming nature.

Medical uses.—It may be used to promote perspiration, but its force is soon exhausted. In light colds, and slight attacks of disease, a free use of this herb, at the same time being warm in bed, will often effect a cure. An oil is distilled from it, that may be taken in warm water, or on loaf sugar, for pain in the stomach and bowels.

HEDEOMA PULEGIOIDES.—Stimulants continued.

Pennyroyal.

STIMULANT, AROMATIC, WITH A PUNGENT, MINT-LIKE TASTE.

For flatulence, colic, sick stomach, and to regulate the action of other medicines.

HEDEOMA PULEGIOIDES. *Herba*—the herb. Pubescent. *Leaves* oblong, serrate. *Peduncles* axillary, whorled. Lower lip of the calyx with two ciliate bristles. Five or six inches high. It grows by the way side and in neglected fields in all parts of the country. It is warming and cleansing to the stomach, and promotes perspiration.

Medical uses.—Pennyroyal is a valuable article, to be used in decoction freely in all cases of sickness, and especially while the patient is under the operation of a course of medicine. It is good to warm the stomach, to expel wind, promote perspiration, and if taken in the beginning of a cold it will break it up. An oil is distilled from the herb, which may be used for the same purposes as the decoction.

COCHLERIA ARMORACIA.—Stimulants continued.

Horse Radish.

STIMULANT, AROMATIC, STOMACHIC, AND PUNGENT.

To promote appetite, and assist digestion.

COCHLERIA ARMORACIA. *Radix*—the root. Radical leaves lanceolate, crenate ; cauline ones gashed.

It grows wild in some places, but is principally cultivated in gardens. It flourishes best in a damp soil.

Medical uses.—The roots may be given to promote digestion, pickled in vinegar, or grated in water to remove pain in the stomach and bowels. The leaves are sometimes applied externally to ease pain, but they are apt to raise a blister.

SATUREJA HORTENSIS.—Stimulants continued.

Summer Savory.

STIMULANT, GENTLY CARMINATIVE, AND AROMATIC.

To promote perspiration, and assist the operation of emetics.

SATUREJA HORTENSIS. *Herba*—the herb. *Peduncles* axillary, somewhat in a cyme. *Leaves* lanceolate, entire. *Stem* brachitate.

This herb is often cultivated in gardens, for culinary purposes. It is of a warming nature, and possesses an agreeable flavor.

Medical uses.—In decoction, it is good for colds and to clear the stomach, and may be used at discretion in any case of sickness as a substitute for composition.

An oil is distilled from this herb, which is an excellent article to ease the tooth-ache. Apply it to the affected tooth on cotton.

SINAPSIS NIGRA.—Stimulants continued.

Mustard.

STIMULANT, AROMATIC, AND PUNGENT.

To create an appetite, and assist digestion.

Sinapsis Nigra. *Folia*, *Semina*—the leaves and seed. *Silique* glabrous, three-sided, somewhat smooth, close pressed to the stem. *Leaves* at the top, lance-linear, entire, smooth. Naturalized.

Mustard is cultivated in gardens, and principally used for culinary purposes. The young leaves may be taken in vinegar, and the seeds may be pulverized and taken instead of pepper.

Medical uses.—Given in decoction, it eases pain in the stomach and bowels, expels wind, &c. it may be used both internally and externally for rheumatism, but its force is very soon spent.

NEPETA CATARIA.—Stimulants continued.

Catmint—Catnip.

STIMULANT, AROMATIC, AND SOMEWHAT PUNGENT.

For colds, and pain in the stomach and bowels of children.

Nepeta Cataria. *Herba*—the herb. *Flowers* in whorled spikes. *Leaves* petioled, cordate, tooth-serrate.

Catmint is a very common herb, growing by the road side and along hedges. It has a strong and not a disagreeable odor.

Medical uses.—Catmint may be given in decoction as a substitute for any of the other mints. It may be used in poultices, and is good for worms in children, and is also serviceable in hysterics and female obstructions.

SOLIDAGO ODORA.—Stimulants continued.

Golden Rod—Sweet scented Golden Rod.

STIMULANT, AROMATIC, CARMINATIVE, DIAPHORETIC, AND DIURETIC.

To be used in infusion, when under the operation of an emetic, &c.

SOLIDAGO ODORA. *Herba, Flores*—the herb and flowers. *Stem* erect, pubescent. *Leaves* lance-linear, entire, glabrous, rough-edged. *Racemes* panicled. The upper part of the stem is furrowed; racemes two or three inches long, spreading horizontally, each generally accompanied by a leaf. *Bracts* oblong, smooth. *Stalk* angular and rough.

This is the true golden rod tea-plant. The flowers dried make a pleasant tea, which promotes perspiration. Its taste is sweet and spicy.

Medical uses.—It may be used in decoction, for head-ache, or substituted for any kind of mint tea. The distilled oil is good to scent our vegetable snuff, and reduced to essence, is serviceable for the head-ache, to be taken, or bathed on the temples.

ANTHEMIS CORTULA.—Stimulants continued.

Mayweed—Wild Camomile.

ANTISPASMODIC AND EMMENAGOGUE.

Its medical virtues the same as camomile.

ANTHEMIS CORTULA. *Herba*—the herb. *Receptacle* conic; chaff bristly. *Seed* naked. *Leaves* two-pinnate. *Leaflets* subulate, three-parted.

This herb grows in old pasture lands, by the road side, and among rubbish.

Medical uses.—Mayweed is good to be taken at night on going to bed, to raise a perspiration, and assist in throwing off a cold. To aid it, let a hot brick or stone be put to the feet. Let it be taken in form of tea, as hot as it can be borne.

ANTHEMIS NOBILIS.—Stimulants continued.

Camomile.

MILD TONIC, STRENGTHENING TO THE STOMACH, AND DIURETIC.

Useful to restore tone to the digestive organs, and increase the appetite.

ANTHEMIS NOBILIS. *Herba, Flores*—the herb and flowers. *Leaves* two-pinnate. *Leaflets* three-parted, linear-subu-

late, sub-villose. *Stem* branching at the base. Gives out a fragrant odor.

Camomile is cultivated in gardens, as well for its agreeable odor as for its medical properties.

Medical uses.—Camomile is good as an external application for sprains, bruises, callouses, corns, shrunk sinews, &c. It is a pleasant bitter, good for the stomach, and for bowel complaints. For external application, let the herb be bruised and applied warm, or used in tea as a wash; for internal use, take it in form of decoction—both herb and flowers.

CHRYSANTHEMUM PARTHENIUM.—Stimulants continued,

Feverfew.

A MILD TONIC, AND CORRECTOR OF DIGESTION.

To be used the same as camomile.

Chrysanthemum Parthenium. *Herba*—the herb. The *leaves* petioled, compound, flat. *Leaflets* ovate, gashed. *Peduncles* branching, corymbed. *Stem* erect.

Medical uses.—Feverfew is stimulating, and removes obstructions from the urinary passages. It is also serviceable in hysterics and all female obstructions. It should be taken in decoction, either alone or with camomile. The whole herb is used.

Simple Tonics.

BETULA LENTA.

Black Birch—Spicy Birch—Cherry Birch.

TONIC, MILDLY ASTRINGENT, AND STOMACHIC.

To strengthen digestion, and for all complaints of the bowels.

Betula Lenta. *Cortex*—the bark. *Leaves* heart-ovate, sharp-serrate, acuminate; nerves and petioles, pilose beneath. *Scales* of the strobile glabrous, with obtuse equal lobes, having elevated veins.

This is a large tree, common in the American forests. Its bark is very sweet scented.

Medical uses.—Black birch bark, in decoction, is useful in

all complaints of the bowels, and in all cases of obstruction. Made into a syrup, with peach meats or cherry stone meats, it is an excellent article to promote digestion, and to use as a general restorative.

PANAX QUINQUEFOLIA.—Tonics continued.

Ginseng.

TONIC, NERVINE, MILDLY STIMULANT, AND A SIALOGOGUE.

Used in nervous dibility, either alone or combined with other articles of like quality.

Panax Quinquefolia. *Radix*—the root. *Root* fuciform. *Leaves* ternate, quinate. *Leaflets* oval, acuminate, petioled, serrate.

Ginseng grows common in most parts of the United States, especially in Vermont. It is found in deep shady forests. This is the Chinese panacea.

Medical uses.—This may be employed as a tonic nervine, in all cases of debility. The best form of administering it, is the pulverized root in decoction. It may be given in combination with other nervines, where such articles are needed. It also has some action on the salivary glands.

Dose, from a half to a teaspoonful, at discretion.

ANGELICA ARCHANGELICA.—Tonics continued.

Archangel.

TONIC, BITTER, AND BALSAMIC.

To correct and strengthen digestion, and remove canker.

Angelica Archangelica. *Herba*—the herb. This is a biennial plant, with the odd terminal leaf lobed.

Archangel grows among grass in wet lands, and by the side of fields. It is from four to twelve inches high, with small leaves, and has a bur which contains a seed at each joint of the stalk. There are two kinds, that look much alike but are different in taste. The one is of a bitter, the other of a rough and balsamic taste.

Medical uses.—Both kinds of the archangel may be used together, in decoction or syrup. The bitter corrects the bile, and the rough removes the canker. Either or both kinds may be profitably used, where articles of like properties are needed.

INULA HELENIUM.—Tonics continued.

Elecampane.

TONIC, AND EXPECTORANT.

To be used in weakness at the lungs, coughs, and consumption.

Inula Helenium. *Radix*—the root. *Leaves* clasping, ovate, rugose, toumentose beneath. *Scales* of the calyx ovate.

This is a common plant, growing wild along the road side, and in neglected places.

Medical uses.—A syrup made of the root is an excellent article for a cough, or any debility of the lungs. Its tonic and expectorant qualities united render it a useful article in such cases.

VERBASCUM THAPSUS.—Tonics continued.

Mullein.

TONIC INTERNALLY, AND EXTERNALLY REDUCES SWELLING, AND RESTORES CONTRACTED SINEWS.

Used mostly as an external application.

Verbascum Thapsus. *Semina, Folia*—the seeds and leaves. *Leaves* decurrent, downy both sides. *Stem* generally simple, though sometimes branched above. *Flowers* in a cylindric spike.

Mullein is a very common plant, growing on poor, sandy soil, along the road side, &c. It is from two to four feet high.

Medical uses.—The leaves bruised and applied warm are a good application to swellings and contracted sinews. An oil is also obtained from the seeds, which is good for the same purposes. It may be usefully employed compounded, as a genial strengthening plaster.

OROBANCHE UNIFLORA.—Tonics continued.

Birth-Root—Squaw-Root.

TONIC, ASTRINGENT, AND STYPTIC.

For slight cases of debility, bleeding at the lungs, and female complaints.

Orobanche Uniflora. *Radix*—the root. *Scape* naked, one-flowered. *Calyx* without bracts. *Corol* recurved. It is about three inches high, of a yellowish white color.

Medical uses.—Its astringent and styptic qualities render it useful in cases of bleeding at the lungs or nose; for the first of

which let it be taken in decoction, and for the last, in the form of snuff, made from the pulverized root. It may be used in cases of debility, and is said to have been employed by the Indians in child birth.

CENTAUREA BENEDICTA.—Tonics continued.

Blessed Thistle.

TONIC AND BITTER.

To strengthen and assist the digestive organs.

Centaurea Benedicta. *Folia*—the leaves. *Leaves* semi-decurrent, tooth-spinose. *Calyx* with branched spines. It is cultivated in gardens, for medical purposes.

Medical uses.—It is a good corrector of the bile and restorer of digestion. It may be given in decoction, or the leaves may be dried and pulverized and given in substance.

The *bitter thistle* much resembles the above, and may be employed for the same purposes, and in the same way.

ASARUM CANADENSE.—Tonics continued.

Canada Snake-Root.

TONIC, STIMULANT, AND AROMATIC.

To give tone and strength to the stomach.

Asarum Canadense. *Radix*—the root. *Leaves* kidney-form, in pairs. *Calyx* woolly, deeply three-parted; divisions sub-lanceolate, reflected.

It grows throughout the United States, in woods and shady places.

Medical uses.—Canada snake-root may be used as a tonic in all cases of debility. It may be given either in decoction or powders.

POLYGONUM PUNCTATUM.—Tonics continued.

Smartweed—Water Pepper.

TONIC AND STYPTIC.

To strengthen the digestive organs, and stop uterine hemorrhage.

Polygonum Punctatum. *Herba*—the herb. *Stamens* eight—*styles* three. *Leaves* lanceolate, glabrous. *Stipules*

lax, glabrous, ciliate at the apex, spotted. *Spikes* filiform, weak, somewhat nodding. *Bracts* remotely alternate.

This is a very common plant, growing on poor, uncultivated lands. It is from one to two feet high.

Medical uses.—Smartweed given in decoction is a gentle tonic, but is chiefly useful to prevent uterine hemorrhage—for which purpose let it be given in a strong tea, made palatable with milk and sugar. The same may also be given in injections, per the vagina.

Simple Bitters.

ARTEMISIS ABSYNTHIUM.

Wormwood.

BITTER, TONIC.

To create an appetite, and assist digestion.

ARTEMISIS ABSYNTHIUM. *Herba*—the herb. The *stem* branching, panicled. *Leaves* hoary; radical ones triply pinnatifid, divisions, lanceolate, toothed, obtuse; cauline ones two-pinnatifid or pinnatifid, divisions lanceolate, acutish; floral ones undivided, lanceolate.

Wormwood is abundant in the eastern states, growing by the road side and in neglected places.

Medical uses.—Wormwood is a good bitter, to create an appetite and assist the digestive organs. It may be given in decoction or in the form of tincture. It is also an excellent article to apply to a bruise or sprain.

TANACETUM VULGARE.—Bitters continued.

Tansey.

A STIMULATING BITTER.

For stranguary, female complaints, &c.

TANACETUM VULGARE. *Herba*—the herb. *Leaves* doubly pinnate, gash-serrate. It has a very strong odor, and a bitter and somewhat aromatic taste. It grows wild in highways, and is cultivated in gardens.

Medical uses.—It is used in decoction, which is good for weakness in the back, stranguary, hysterics, and female weaknesses. The green leaves bruised are a good application to sprains and swellings.

INTRODUCTION

TO THE THEORY OF DISEASE, AND THE PREPARATION AND USE OF MEDICINE.

Practitioners of medicine should have some fixed principles by which their conduct should be guided in time of sickness, and we have thought it advisable to lay down a few simple rules, to be observed by those who have no better guide.

To our seniors in experience and practice, of course, we bow with due deference, and yield the palm to their superior medical knowledge in all matters pertaining to practice, so far as the health and welfare of community are concerned. In that respect, being sensible of our inability to compete with them successfully, we must therefore stand subject to their correction. But as to our experience, such as it is "give we unto you." J. T.

RULES TO BE OBSERVED BY THE PRACTITIONER,

IN THE TREATMENT OF DISEASE.

1. At the commencement of an attack of disease, the first thing to be brought to mind should be, what has caused the attack, and how should it be treated, and how removed.

The "ways and means" cause much trouble and speculation with the patient, who should ever be alive to the best means for his future welfare.

2. One of the fundamental principles in the Thomsonian practice is, that all diseases originate from the same cause, directly or indirectly—that is, from the deranged state of the fluids of the body, by the absence of heat, or loss of vitality; which produces an over pressure or excess of circulation to the head, and a proportionate deficiency in the feet.

This creates derangement in the organs of sense, and a proportionate want of action with the digestive apparatus, by which the bowels become constipated, and the evacuations of the body are much obstructed, for want of the requisite action and equilibrium in the fluids, and the consequent order attendant upon such a state of things.

3. This derangement having been produced by the loss of vitality, or taking cold, and the consequent absence of heat at the lower extremeties, and an excess at the head in the same degree, to bring about an equilibrium properly through the system, or to establish order where there is naught but disorder, is what we wish. To restore warmth to the feet and reduce the pressure upon the brain, by correcting digestion, promoting perspiration, and removing obstructions from the stomach, bowels, and their dependencies, is the proper mode to effect this object.

4. The best method yet discovered is a thorough Thomsonian course of medicine, when properly administered, which creates a healthy circulating medium in the lower extremities, equal with that of the head, and thus produces order and regularity both in body and mind.

5. The first knowledge with a practitioner should be to understand the principles or cause of the derangement, disease, or loss of heat; and se-

condly the proper course of treatment to bring the deranged parts to order by restoring the vitality, or heat, by the loss of which the whole man has become diseased.

6. There is no immediate danger in any case where the veins on the patient's hands and feet are full. This is the surest test by which a practitioner may determine whether or not his patient is doing well. Or a long and regular respiration will indicate the same state of the body, as well as a regular pulse.

DIRECTIONS FOR EQUALIZING THE CIRCULATION

Through the system, which must be done in all cases of disease, to restore the patient to health.

In the first place, put the feet of the patient into water as hot as can be borne, increase the heat by adding water of a higher temperature until a copious perspiration is started on the forehead and in the palms of the hands; the patient may be in the bath if thought necessary; this will afford some relief. Then take brown emetic, cayenne, composition, and nerve powder, of each one teaspoonful, put them into one pint of boiling water and let them steep for ten minutes; sweeten with molasses, and let half the quantity be given as an injection, as hot as it can be borne, and let the patient retain it as long as possible. This will turn the excitement from the head downwards and sickness at the stomach will be produced. Then give a table spoonful of the tincture of lobelia and a small quantity of cayenne, in some simple tea, and if this does not produce sufficient vomiting repeat the dose.

The vomiting will be easy, the veins in the hands and feet will be filled, the head, in consequence of the equalization of the circulation, will be relieved, and the whole system will become quiet and easy.

Let these directions be strictly followed, and by so doing I hesitate not to say, that three fourths of the attacks of disease—such as colic, dysentery, quinsy, croup, pleurisy, head-ache, liver complaint, &c.—might immediately find relief. Let every practitioner lay up these remarks as valuable truths, to be observed in all cases where there is disease or derangement in the system, in attempting to afford relief or perform a cure.

Order must be brought about in the body by an equalization of the fluids, and it matters but little how that is effected—whether by a course of medicine, steaming, bathing the feet in hot water, an emetic, or stimulating with hot liquor, hot medicines, or any other course which will effect this relief on the system. To accomplish this successfully in the greatest number of cases is what constitutes the eminent physician.

STEAM OR VAPOR BATH.

Steaming is an important part of the Thomsonian practice. Many cases which prove too stubborn for the medicine unassisted by the vapor bath, are through its agency relieved. In all diseases where the vital heat has become so far exhausted as not to be rekindled by the administration of medicine, steaming is indispensably necessary. In all cases of suspended animation, a gentle bath and bathing the feet in hot water, should be immediately resorted to. In cases of falls and bruises, or accidents of the like, this treatment rarely if ever fails of affording relief. It is also useful in preventing sickness as well as in curing it.

When a person has taken a severe cold, and disease is rapidly getting

hold of the system, a thorough steaming, as hereinafter directed, will frequently throw off the disorder. Always remember while giving the vapor bath, to keep up the internal heat, to prevent faintness ; for which purpose give a tea of cayenne, or of any other warming or stimulating article, with occasionally wetting the patient's face and breast in tepid water.

The most convenient and effectual way to administer the bath is to have a box constructed for that purpose. The following plan is perhaps as good as any Let the box be in the form of a closet, two feet four inches deep, two feet six inches wide, and six feet high. It should be elevated from the floor about six inches, by the means of blocks or legs. Let the bottom be made tight and in form of a sink, with a vessel underneath to receive the condensed water. The door may be five feet and a half high, and one foot ten inches wide, with a hole for ventilation (before which let a curtain be drawn) six by nine inches, about four feet from the bottom. Let the top be boarded tight, and at the bottom, immediately above the sink, let a portable floor, or a board eighteen or twenty inches wide, be supported by means of cleets fastened to the sides of the box, under which let the steam pass in by means of a lead pipe.

This portable floor will break the volume of the steam, cause it to ascend on all sides of the patient, and prevent its burning his feet. But where a box cannot be had, the following method may be adopted.

Have three or four stones or bricks heated, and let the patient sit in a chair, undressed, with a blanket around him, to confine the vapor and shield him from the air; then place a two gallon kettle with a concave bottom, with about one quart of water, between the feet inside of the blanket—put in one of the heated stones, and as soon as that begins to cool put in another, which continue to do till the patient is sufficiently warm, which will usually be in from ten to fifteen minutes.

The patient may stand during the operation in this way, instead of sitting, if able. But when too weak either to stand or sit over the steam, it may be administered in bed, by heating several bricks, wrapping them in wet cloths and placing them around him. Or a better plan is, to have a frame made, to place over the patient's body to elevate the covering, and then pass the steam into the bed by means of a pipe.

The method of producing the steam, in order to administer the bath in the first and last mentioned ways, may be as follows: Have a tin or copper boiler constructed in form of a cylinder, in such a manner as for the heat to pass up through the centre, and to be perfectly air tight except one tube by which to put in water, (to which a tight stopper may be adapted,) and another for the steam to pass out at, on which a pipe must be closely fitted, and from thence passed to the place where you desire to have it. The boiler may be filled with water, and placed on a stove or furnace. As soon as the water commences boiling, the steam will pass out of the tube and through the pipe to any place desired. The temperature of the steam will be regulated by that of the fire over which the boiler is placed, and must be adapted to the patient's strength and ability to bear it.

TREATMENT OF DISEASE.

In all cases where the patient has little or no appetite, and is declining in health and strength for the want of support, simple treatment, such as tonics, stomachics and soothing medicines, ought to be used; but if they fail to answer the purpose, it is evident that the system is laboring under serious difficulties, and that the patient will not find relief until the obstructions are removed, perspiration made free, and digestion regulated.

In such cases, the articles that afforded nourishment in health produce excitement and irritation in the stomach, distress in the head, and a general derangement throughout the internal viscera, the arterial and nervous system, and a feverish excitement on the surface. To remove this, we point out the following plain and simple mode by which all curable forms of disease may be treated successfully, and the patient restored to health. There is no danger attending the operation of the medicines, as in the regular practice; therefore if one course of medicine is given more than was actually necessary, no injury will result to the patient, and the time and medicine is all that is lost. How important, then, that thorough treatment should be observed, when so momentous an object as the life and health of the patient is concerned.

TO BE REMEMBERED.

In all cases where there is inflammation or a concentration of febrile excitement to any particular point, for instance a sprained joint, distress in the head, inflammation of the stomach and bowels, &c., the course of medicine will remove the obstruction by equalizing the fluids throughout the system, by which means the patient will find immediate relief, thus confirming the principle of the UNIT *of disease*. If such concentration of excitement be caused by morbid matter being received into the system by means of a fœtid atmosphere, bad food or putrid water, one course may not be sufficient to exclude all the morbid poison from the secretory vessels, the evidence of which will be the want of an appetite, sickness at the stomach, weakness in the limbs, and a febrile excitement. If so, courses should be repeated at suitable intervals of time, until these symptoms pass away, and by the circulation through the body being equalized a healthy action is restored; the appetite becomes good, the digestive organs perform their natural functions, and the sleep is quiet. Courses of medicine may be successfully employed to remove distress and ease pain, and to make the patient comfortable in all cases of *whitlows*, *felons*, *biles*, *bruises*, or any other excessive inflammatory concentration of the fluids of the body where relief cannot be found from any other course of treatment.

First, soak the affected part in lye made of hard wood ashes, then apply a poultice made of flax seed, or yellow lily, or made of bread and milk, which should be kept moist while under the operation of the course. This will relieve the distress and bring the sore to a crisis, and is perhaps the surest way to relieve the patient. It is expected that all simple means will be tried before the course is resorted to. It should be remembered that all diseases are brought on by derangement of the fluids of the body, and that all diseases can be cured by restoring order and regularity to said fluids. Courses of medicine will effect this, if properly administered and attended to in season. Where there is distress there is disorder and a derangement of the fluids, and consequently a restoration of order and an equalization in the system, will afford relief.

In reading this work, do not forget this important principle; that all diseases herein mentioned are brought about by a decrease or derangement of the vital fluids by taking cold or the loss of animal warmth. And that the name of the complaint depends upon what part of the body has become so weak as to be affected. If the lungs, it is consumption, or the pleura, pleurisy; if the limbs, it is rheumatism, or the bowels, cholic or cholera morbus.

But after all, these different diseases are caused by the partial loss of vitality or warmth, and all may be removed by a restoration of the vital energy, and removing the obstructions which the disease has generated.

It is thought by some that unless the physician know the name which

has been given to the disease by others, he cannot treat it successfully. If he cannot readily call to mind the variety of names so profusely lavished by the regular physicians upon the different forms of disease it will not prevent his medicine from having a beneficial effect, nor prove that the physician has not *valuable practical knowledge*, which is after all the true philosopher's stone of which the patient is in pursuit.

Is it right to infer that because a man cannot command all the names that have been written by other people, as liable to err and as frail as himself, that he cannot by practice, know the use of medicine or the nature of disease: or because he cannot give the respective bones, muscles, ligaments and vessels of the body their appropriate names, he cannot cure the colic or dysentery.

When our pilgrim fathers landed at Plymouth the aborigines brought them long golden ears, of a vegetable substance, which they had never seen or heard of before, neither had the great or learned men of their father land, and we are told that they were kept from starvation, were nourished and rendered comfortable through a long dreary winter by the support this vegetable substance afforded, furnished by illiterate savages. Now shall we deny that these people were nourished and supported by this valuable plant, because they did not know that it was Indian corn, and because it was furnished by those illiterate savages, who knew not the meaning of a diploma and had no knowledge of the Greek or Latin languages? Impossible!! The virtues and nutriment were in the corn, and the true science in the matter was in having the knowledge of it. In this respect the savages were scientific and the pilgrims were the quacks, notwithstanding their boasted knowledge in other respects. Give us more practical knowledge and less theorizing; more of true science and less speculation. To remove the infirmities of our fellow men, give us more innocent vegetable substances and less poisons. Then shall we be led to rejoice over the bounties of Providence, in filling the soil with innocent remedies that the poor suffering sons of humanity may there find an antidote for every bodily ill.

COURSES OF MEDICINE. No. 1.

First—To prepare for the course, let the patient take a dose of composition, or No. 6, in herb tea, hot, then go into the bath and put his feet into hot water; raise the heat of the bath to about 100 or 110 deg. Fahrenheit. After a lively perspiration starts, and the veins have become full upon the feet, hands and temples, and the pulse much quickened, say to 95 or 100 per minute, take a quart cup of cold water and add hot water to it until its temperature is about that of the surrounding atmosphere; then open the door of the bath, and have the feet taken out of the pail, and pour your water over the head and shoulders, completely drenching the whole surface of the body and limbs. Then let the patient step out of the bath and be rubbed with a coarse napkin or towel. The indications of a healthy action now are, full veins on the extremities and a lively red appearance in the flesh throughout the system. Now let the patient go into a warm bed, with a hot stone, brick or jug of hot water at his feet.

Secondly.—Take two ounces of No. 3, or canker tea, and put it in a quart bowl, and pour upon it one pint of boiling water; let it steep about ten minutes, strain off three gills, and when hot add two teaspoonsful of brown emetic, one teaspoonful of cayenne, one teaspoonful of nerve powder, and if it is a putrid case, one tablespoonful of No. 6; sweeten it with molasses or sugar. Pour off a wineglass full of this comp-

ound, and give it to the patient as soon as he is in bed, and then let half a pint of the same compound be given as an injection. Let two or three wineglasses more be given with about half a teaspoonful of emetic in each, at intervals of fifteen minutes, if that given first does not operate sufficiently. While under the operation of the course, let the patient drink freely of a tea made of spearmint, peppermint, pennyroyal, or summersavory, and also of milk porridge or crust coffee, which will nourish and invigorate the body.

Thirdly.—In from three to six hours the patient will generally be through with vomiting and the stomach settled : then let him take a second bathing precisely similar to the first; let him stay in ten or fifteen minutes, remembering to shower with the tempered water on coming out. Let the surface of the body be rubbed thoroughly and then apply to it some cold whiskey and water, to completely close the pores, and the patient may then dress and wash his hands and face in cold water, and if the stomach and bowels have been thoroughly cleansed, he will feel completely well.

Fourthly.—Let the patient take of the bitters No. 4, or syrup No. 5, to restore the digestive organs, and his health is soon restored.

This course may be repeated if thought advisable, but it is the most powerful one that is usually administered.

Course No. 2.

In case of inflammatory sore throat, quinsy, rattles or croup, take a dose of composition, cayenne, or No. 6., then take a bath as in course No. 1. Bathing the feet alone will answer, if the bath cannot be handily applied: then give one fourth of a glass of tincture of lobelia, after which give an injection as prepared in course No. 1. or the brown emetic may be put into a boiling hot tea of composition, witch hazle, or red raspberry leaves. This will change the field of excitement from the upper to the lower extremities, and will also turn the pressure of blood in like manner from the head, lungs and neck to the bowels and feet.

In all cases of difficulties or inflammation about the region of the lungs or head, the injection should be made sweet with molasses to loosen the bowels, and very stimulating with No. 2, and sufficiently powerful with brown emetic to cause the patient to vomit, and should contain also a teaspoonful of nerve powder, or instead thereof two teaspoonsful of the tincture of asafetida, to quiet the nervous system while under the operation. Repeat the tincture by the stomach, if the injection does not cause sufficient vomiting, and immediate relief will be the result, unless the patient is very low, or beyond the reach of medicine.

After the medicine is done operating, the steam may be applied as in course No. 1; the body bathed with whiskey and water, and the feet and legs with stimulating liniment. Put a stimulating plaster about the neck, with the sides notched, so that it may extend to the edge of the chin, and over this put one or two thicknesses of flannel to keep the neck warm. The same plasters may also be applied to the feet to good advantage. This treatment turns the circulation so completely to the lower extremities that relief is almost instantaneous. In the recent state of the disease this treatment soon brings the difficulty to a crisis, and the patient recovers with very little trouble. In cases of croup or rattles, cloths wet with hot whiskey and water wrung out and applied to the bowels as hot as can be borne, and often changed, are a great assistant to the other treatment in restoring the lost heat or vitality by absorption.

With such practice we have relieved many cases of violent disease of the chest and head, and these directions should be remembered and followed by all in similar cases.

Course No. 3.

There are various forms in which the emetic may be given. A light course may be given a child; by first bathing the feet in hot water and giving freely of penny royal, spearmint, pepper mint, or summer savory tea, with the addition of a little cayenne and lobelia tincture. Then to a cup of the hot tea add half a tea-spoonful of cayenne, the same quantity of brown emetic, and a tea-spoonful of the tincture of asafœtida, and give it as an injection. It will produce copious vomiting, take the distress from the head, and produce immediate relief.

After the operation the body of the child may be bathed thoroughly with whiskey and water about blood warm. Put on clean, warm, dry clothes, and place the little patient in bed, and it will feel much relieved and refreshed.

If the stomach is so weak or irritable as to reject the cayenne or emetic, given as above directed, let the patient drink herb tea until the system becomes moist with perspiration, then give the emetic in form of pills, or in honey, any kind of sweet meats, preserves or syrup, or in weak pearlash or saleratus water; in any of the mint teas or simple drink; or it may be given in toddy, sling, beer or cider. It may also be taken in lemonade or orange juice and in a great variety of other ways.

If the patient is determined not to take the emetic, he may be deceived by preparing it in one of the above forms, and not know that he has taken it untill it begins to operate.

Then by giving the herb teas or composition, a thorough course may be had without much trouble. But if the child detects the taste of the emetic when mixed with these articles, let him taste of some of the drinks made pleasant, just sufficient to produce a desire for more, then put in your emetic, unnoticed by the patient, and let them hurry to drink it before the taste is detected, or they have a chance to know what it is.

Course No. 4.

Let the patient take of composition or herb tea till an easy perspiration is started, then administer half a dozen emetic pills; they will gradually dissolve, and the secretions will take up their emetic properties and nausea will be continued for some time before vomiting takes place. If the operation is not sufficient, an injection as directed in Course No. 1, may be administered, or instead of brown emetic, the tincture may be substituted, and if thought advisable a half dozen more pills may be taken. This will generally answer the purpose. After the medicine has done operating, take a vapor bath as directed in Course No. 1, remembering if the circulation is not good in the extremities, to bathe the feet in hot water, and then apply to the feet and legs the stimulating liniment.

The proper application of these courses of medicine, in the various forms of disease to which man is subject, we consider the key-stone in the grand arch and superstructure of the Thomsonian system of practice; for without the lobelia, cayenne and the vapor bath, the grand bulwark of the system would be wanting. These valuable articles stand in the front and foremost rank to oppose all attacks, stages and forms of disease to which frail humanity is subject.

ALKALIES

To remove acidity and sweeten the stomach, before, at the time and after the operation of the Course of Medicine.

STONE-LIME, OR LIME MADE OF OYSTER-SHELLS, PEARLASH OR SALERATUS.

Take half a pound fresh burned lime and put it into two quarts of good, clear, soft water, let it slack and stand twenty-four hours, being stirred

three or four times during the first six or eight hours. Then remove the scale from the surface and bottle what will run off clear for use. Take from half to a glass two or three times a day. If it is too strong, reduce it with water. *Pearlash* or *saleratus* may be used in the same way. If at any time too much alkali is taken and distresses the stomach, it may be neutralized immediately by drinking a little cider or vinegar, and the stomach preserved from injury. These counter substances, or irritants, should ever be kept in mind by the physician for the benefit of the patient when using either.

ENEMAS, OR INJECTIONS.

In order to remove a disease, the medicine must be applied to the part where the cause originated. Therefore, when the bowels are concerned, either directly or indirectly, in producing the disorder, whatever it may be, injections are very important.

Where an evacuation of the bowels is all that is necessary, a tea of cayenne, made very sweet with molasses, will answer every purpose. But in cases where a course of medicine is requisite, the most usual manner of preparing one to be used at that time, is to make a strong tea of composition No. 3, red raspberry or witch hazle leaves; strain it, and while hot add half a teaspoonful of cayenne, two tablespoonsful of molasses, and when cool enough to be administered, add a teaspoonful of nerve powder and the same quantity of the tincture of lobelia; and if there is danger of mortification, add a tablespoonful of No. 6. In cases of exceeding pressure, or great distress in the head or breast, add to the injection as usually prepared, from one to three teaspoonfuls of brown emetic, (pulverized lobelia seed) and bathe the feet in hot water and liniment.

In case of dysentery, or any local disorder of the bowels, such articles ought always to be put into the injections as are useful in such disorders, if given by the stomach.

When the uterus or urinary passages are affected, injections may be given to these parts by means of the appropriate syringes. The quantity to be used as an injection of the bowels should be from a gill to a pint.

Syringes of all sizes, and for all the different purposes, should be kept on hand by every practitioner.

For those who are costive, a little molasses and water, with the addition of a small quantity of cayenne, will be very serviceable. Or instead of that, a tea made of ginger, pennyroyal, spearmint or peppermint, may be sweetened with molasses and used, and by adding cayenne and lobelia a course of medicine may be given. A little warm soap-suds will frequently answer a good purpose in removing costiveness, and create quite a natural action of the bowels.

NOTE.—In all cases of pressure in the *eyes*, *head*, *breast* or *lungs*, injections should be used, and the feet bathed if necessary, as it shows a deranged or disordered state of the bowels, and consequent want of circulation in the feet.

MEDICAL COMPOUNDS.

Preparations of Emetic.

No. 1.—LOBELIA INFLATA.

1. Take of the leaves of lobelia inflata, finely pulverized, one teaspoonful, in warm water sweetened, or in a tea of red raspberry leaves, or any tea proper for removing canker, with prepared composition, cayenne, or hot drops, as a stimulant. The dose is to be repeated till the desired effect is produced.

This preparation is for the less violent attacks of disease.

TO PREPARE LOBELIA SEED WITH SUGAR.

2. Take of the seeds of lobelia, finely pulverized, one pound, and one pound of white sugar—pulverize them well together (the sugar being designed to absorb the oil); then add a quarter of a pound of nerve powder, half a pound of cayenne, and one gallon of improved rheumatic drops.

Dose, two teaspoonsful for an adult, in a gill of bayberry or composition tea.

TO PREPARE THE LEAVES AND PODS.

2. Separate the leaves and pods from the stalks, pulverize and sift them; to be preserved from the air.

For a dose, take a teaspoonful, in a wineglassful of warm tea made of cayenne, or No. 6, or spearmint, peppermint or penny-royal tea, sweetened, or instead, the same quantity of any of the simple or canker teas. Repeat the dose at intervals of fifteen or twenty minutes till sufficient vomiting has been produced. If the patient is very weak, or in case of a child, the liquor should be strained, and the dose moderated according to the circumstances and age.

TO PREPARE THE TINCTURE.

4. Take the green herb, in any stage of its growth, (if the plants are small take the roots also) pound them fine, and put them into an equal quantity of fourth proof spirits; let it saturate thoroughly, then strain and press out the liquor, to be preserved closely bottled for use.

Good vinegar or pepper sauce may be substituted for the spirits. This is an effectual counter poison, either internally or externally applied. It is good in asthma, consumption, and all complaints of the lungs.

For a dose, take a teaspoonful once in twenty minutes, if the first does not have the desired effect. By adding a little cayenne, and in nervous cases a small quantity of nerve powder, its operations will be more effectual.

TO COMPOUND THE THIRD PREPARATION.

5. Take of the lobelia seeds and cayenne, each two ounces, finely pulverized, and one ounce of nerve powder, and put them into a pint of No. 6, shake them well together, and preserve it closely corked for use.

This is for the most violent attacks of disease, such as tetanus or lock-jaw, hydrophobia, drowning, fits, spasms, and all cases of suspended animation. In all cases where the jaws are set, pour this into the mouth, between the cheek and teeth, and the muscles will relax and the mouth will soon come open. It goes through the system like electricity, giving heat and life to every part.

EMETIC PILLS.

6. Take an ounce of the extract of peach leaves, poplar or butternut bark, one teaspoonful of cayenne, half an ounce of pulverized lobelia seeds, two teaspoonsful of nerve powder, and a few drops of the oil of pennyroyal, spearmint, or peppermint; mix the solid articles well together, and form into a mass with the extract. If too soft, add more of the lobelia and nerve powder; if too hard, add more of the extract. Then make it into pills. They may be taken, from two to six at night, on going to bed.

They are good to cleanse the stomach of morbid matter, to cure sick headache, colic, flatulency, &c.

Take from six to twelve, and drink some warm herb or ginger tea, and they will operate smartly as an emetic. This is about as easy a way as a lobelia emetic can be taken.

PREPARATIONS FOR CHILDREN.

When emetics are given to children, the doses must be regulated according to their age. The best general directions are, to steep a teaspoonful of the pulverized herb in a teacupful of hot water, with a little ginger, strain and sweeten, and give of it a teaspoonful once in ten minutes till it operates. If the tincture is used, a teaspoonful of it may be put into a wineglass of hot water, and then taken as above. In giving medicine of any kind to children, much depends on the discriminating judgment of the practitioner.

Note.—The tincture of lobelia is one of the best remedies in use for the bites of poisonous insects or reptiles; also for inflammations, cuts, bruises, old ulcers, &c. Put three or four thicknesses of cloth upon the wound, and keep it constantly wet with the tincture, and occasionally let a teaspoonful be taken inwardly, if sick at the stomach.

Stimulants.

No. 2.—CAYENNE PEPPER,

Capsicum Baccatum, and Frutescens.

These are active stimulants, and the best things known to raise and retain the natural heat of the system. They are powerfully stimulating substances, but act only in accordance with the laws of life. They cleanse the salivary glands, promote perspiration, and remove obstructions. A decoction of cayenne will cure the colic or cholera morbus, remove cramp, or pain in the stomach and bowels, in the last of which it is excellent for children, boiled in milk; and should always be used in courses of medicine. [See page 590.]

RED PEPPER—*Capsicum Annuum.*

COMMON GARDEN PEPPER.

This is a stimulating substance, next in value in that respect to cayenne, for which it may be substituted. when that cannot be procured. [See page 593.]

BLACK PEPPER—*Piper Nigrum.*

This article is a gentle stimulant, and when necessary may be substituted for the above. Boiled in milk, it is a good remedy for relax and dysentery. [See page 596.]

GINGER—*Zingiber Officinale.*

Ginger is a stimulant, useful to be employed in all cases as a substitute for the above articles, when they are not to be had. It answers a good purpose, used instead of composition in giving courses of medicine, when cayenne cannot be obtained. It is good in all pulmonary affections. The root may be chewed as a substitute for tobacco, and is very useful for bleeding at the lungs, asthmatic difficulties, flatulency, pain in the side, or distress from food. [See page 594.]

After having given courses of medicine, great care must be observed to prevent taking cold, and to keep up the internal heat so as to maintain perspiration, which can be done by giving occasionally a little of No. 2, either alone or combined in the composition powders; and courses should be occasionally administered, if necessary, until all symptoms of disease have disappeared. It is better to apply more courses than are wanted, than that one should be neglected that is necessary. Be vigilant in the use of the medicine till out of danger.

Astringents.

No. 3.—THE DIFFERENT ARTICLES.

BAYBERRY—*Myrica Cerifera.*

This is an excellent remedy for canker, and is good for derangement of the stomach and bowels. By using it as a dentifrice, and drinking a little of the tea occasionally, it will cleanse the teeth and gums, and prevent an offensive breath. A strong tea of this article will remove the adhesive matter from the mucous membrane of the stomach and intestines, and create an appetite. Taken with the emetic, it is very useful to remoke canker. It is an excellent sneezing snuff. [See page 597.]

WHITE POND LILY—*Nymphæa Odorata.*

An excellent article for derangement of the bowels, and is good for canker in any of its forms. Made into syrup, it is useful for children in looseness of the bowels or while teething, and will sweeten the mouth, and cleanse old ulcers. A syrup may be made of the flowers that is useful for nursing sore mouth, with mothers as well as children. [See page 598.]

This article it would be well for every family to keep on hand.

HEMLOCK—*Pinus Canadensis.*

The boughs in decoction are excellent for strengthening the back and kidneys. This infusion has been used as a constant drink in bilious countries, and in this way those who have employod it have avoided the diseases incident to such places.

By boiling the boughs, they yield an extract which may be profitably employed in the form of plasters.

The bark is a good astringent, which may be used for canker, either alone or compounded with any of the articles under this head.

The gum may be used instead of rosin in strengthening plasters, and made thin by the addition of lard and a little cayenne, is very useful for rheumatism or weakness of the back.

MARSH ROSEMARY—*Statice Limonium.*

Is very good for sore mouth, throat, and all cases of canker. It is much used along the sea board for thrush, and difficulties of the stomach and bowels. Care should be taken that it is not too drying to the glands of the mouth and throat. [See page 601.]

This may be used compounded with bayberry or witch hazle leaves in courses of medicine, or for injections and as a drink for canker.

SUMAC—*Rhus Glabrum.*

This is an astringent valuable in dysentery, and may be used the same as bayberry, for which it may be substituted in courses of medicine and all cases of canker. It may be compounded with witch hazel, and used generally where canker medicine should be employed, especially for children. The berries may be compounded with red raspberry leaves, to be used in the courses of medicine, and for canker. [See page 602.]

WITCH HAZEL—*Hamamelis Virginica.*

In decoction, it is useful for bleeding at the lungs, stomach or bowels, and in snuff, for bleeding at the nose. This valuable article may be used in giving courses of medicine alone, or compounded with sumac or red raspberry. It is very serviceable in dysentery, relax, or any other complaint of the bowels or stomach. Chewing the leaves alone is good for sore mouth. A wash made from them· is excellent to cleanse old sores and dry up ulcers in various parts of the body. [See page 603.]

RED RASPBERRY—*Rubus Strigosus.*

Red raspberry leaves are an excellent substitute for imported tea. The decoction is a valuable remedy for canker in courses of medicine, for which purpose it may be used instead of other articles under this head. It is good for sore mouth; and made into a poultice it is a first rate article for scalds, freezes, old sores, &c. A tea made of the leaves may be used to great advantage during hot weather. It braces up the body, and keeps off faint and languid feelings.

Women, for some time previous and during the time of delivery, should keep on hand and make free use of this tea. The fruit is wholesome and nutritious. [See page 604.]

LIBERTY TEA—*Ceanothus Americana.*

This plant is mucilaginous, and one of the best articles in use for summer complaints, and is also good for sore mouth and throat. It is an excellent tonic, and has been usefully substituted for imported tea. It should be gathered and preserved, to be used in the complaints incident to child-

ren. It is a great regulator of the bowels, and used in tea as a constant drink is valuable for dysentery or relax. [See page 606.]

COCASH—*Aster Hyssopifolius.*

Cocash is good for vertigo, nervous affections, and coldness of the extremities. It may be profitably employed as a remedy for canker. If bruised and put into gin, it makes an excellent bitter, useful in rheumatism and nervous affections. People in vicinities where it grows should gather it for use. In bilious countries it is an excellent article to prevent fevers and bilious complaints. [See page 607.]

AVENS ROOT—*Geum Virginianum.*

This article is good in canker or general debility, and may be usefully substituted for chocolate. It may be used as a constant drink in putrid complaints to advantage. In ague countries, if constantly employed, it will prevent bilious complaints, as well as a disordered state of the bowels. It is a good substitute for Peruvian bark. Its tonic powers are well known to the people in the neighborhoods where it grows. It should be preserved. [See page 608.]

CRANESBILL—*Geranium Maculatum.*

It is good in cholera infantum, hemorrhage of the lungs or bowels, and in all relaxed debilitated conditions of the body. This article is much like avens root, witch hazel, red raspberry and sumac, and may be used in like manner. It is very useful, simmered in honey, for sore mouth or complaints of the bowels. A quantity of this root should be gathered and kept on hand by those who cannot obtain bayberry bark, to be used for similar purposes. [See page 609.]

BLACK OAK—*Quercus Rubra.*

Useful in fever, diarrhœa, scrofula, and all cases of canker. The acorns simmered in honey are good for sore mouth and throat. Care should be taken that this article is not given too strong, as it may create too great an astringency upon the glands of the mouth and throat. It may be reduced in its astringent properties by the use of sage, avens root or cranesbill, which possess nearly the same qualities, but are not so strong astringents. [See page 610.]

SAGE—*Salva Officinalis.*

Sage is an excellent article to quiet nervous and mental excitement, and prevent putrifaction. It is good for worms or bowel complaints in children. It is also a valuable article to clear the head, when used in connection with senna—half an ounce of each in half a pint of hot water, with a teaspoonful of ginger. This will afford great relief to the head as soon as it operates. Simmered with borax and honey, it is an excellent wash for sore mouth in children, and for women in uterogestation. Its trial will prove its virtues. Sage should be preserved for family use. [See page 611.]

COMPOUNDS OF NO. 3.—FOR CANKER.

1. Take equal parts of bayberry and white pond lily root, pulverize fine, and mix well together. Steep one ounce in a pint of boiling water, and let it be well sweetened, and add a little cayenne. Of this, give for a dose a wineglassful, and repeat it at discretion. If a nervous case, add

half a teaspoonful of nerve powder, and from one to two teaspoonfuls of asafetida.

2. Take sumac, red raspberry and witch hazel leaves, with marsh-rosemary, of each an equal quantity; let them all be finely pulverized and well mixed. In case of an attack of cold add a little of No. 2.

To be taken the same as the preceding. These articles may be used in course, and separately if necessary.

3. Take red raspberry, avens root, and marsh-rosemary, of each equal quantities, finely pulverized; mix the articles well together, and they make an excellent canker remedy, and one that is highly useful in diarrhœa, and all relaxed states of the bowels.

For a dose, take a teaspoonful, in a wineglassful of hot water, sweetened.

4. Take cranesbill and witch hazel, equal quantities of each, and half the quantity of black oak bark, well rossed, dried, pulverized and mixed. This may be used in the same way and for the same purposes as the one next preceding. Add a little golden seal, and it makes an excellent bitter.

5. Take of sage, cocash and liberty tea, each one pound, pulverize and mix. This is an excellent article for all derangement of the bowels, especially where it is attended with nervous or mental excitement.

Take for a dose, a teaspoonful, in half a teacupful of hot water, repeated as often as the circumstances require.

6. Take hemlock, black oak and bayberry barks, of each an equal quantity; let them all be finely pulverized and well mixed. This is a powerful astringent, to scour the canker from the glands and mucous membrane of the whole alimentary canal.

Dose, a teaspoonful, in a half pint of hot water, sweetened. This must not be used too freely, and may be tempered with either of the preceding articles that possess less astringent power.

These different compounds may be used in courses.

N. B. In all compounds for canker or cold, a little cayenne should be added, as it renders the medicine much more effectual; and the patient should be, when the medicine is used, kept warm in bed, or shielded from the air by an over-coat or blanket.

These compounds are very valuable, and should be kept on hand by all who use Thomsonian medicine. In taking these medicines, great care should be observed to keep from taking cold, and recovery is generally very rapid.

Let the patients always drink freely of milk porridge or other nourishment while using these medicines, if they have an inclination to eat; but never force the appetite, as nature will regulate her own work. By forcing the appetite, you generate disease.

Bitters.

No. 4.—THE DIFFERENT ARTICLES.

BALMONY—*Chelone Glabra.*

This is a bitter of the first order. It corrects the secretions of bile, creates an appetite, and gives health and activity to the digestive organs [See page 613.]

GOLDEN SEAL—*Hydrastis Canadensis.*

This article is an excellent bitter tonic, to be used for dyspepsy, and all derangements of the digestive organs. [See page 613.]

POPLAR—*Populus.*

An excellent remedy for indigestion and costiveness, and is also good for urinary difficulties, in combination with hemlock boughs. The buds and small twigs may be used in decoction for worms, or disordered bowels. [See page 615.]

BARBERRY—*Berberis Vulgaris.*

This is a good bitter to correct the gall and regulate digestion, and will also remove costiveness. It is gently laxative. [See page 617.]

BITTER ROOT—*Apocynum Canabinum.*

It will remove costiveness, correct the secretions of gall, and remove obstructions in the whole alimentary canal. In dropsical cases it will operate as a hydragogue cathartic. [See page 619.]

UNICORN ROOT—*Aletris Ferinosa.*

Unicorn is a valuable tonic, and may be employed for the same purposes as the other articles under this head. It is peculiarly serviceable in female weaknesses and nervous debility, and is an excellent article for cough and pain in the side. [See page 620.]

BOXWOOD—*Cornus Florida.*

It increases the animal warmth, strengthens the digestive organs, and obviates female weaknesses. [See page 621.]

GOLD THREAD—*Coptis Trifolia.*

This article is a tonic which may be substituted for golden seal or barberry; and its astringent properties render it peculiarly serviceable for sore mouth or throat, when used with honey and borax. [See page 622.]

HOREHOUND—*Marubium Vulgare.*

This herb is valuable as a tonic, and may be used to great advantage in coughs, consumptions, and general debility. [See page 622.]

COMFREY—*Symphytum Officinale.*

A tonic, good in all cases where mucilaginous medicines are useful, but more especially in female weaknesses. [See page 623.]

COMPOUNDS OF No. 4.

1. Take balmony, bayberry and poplar bark, each equal parts, pulverized and well mixed. To one ounce of this compound add a pint of boiling water and half a pint of spirits.

Dose, half a wineglassful three or four times a day.

To the above add one teaspoonful of cayenne for every ounce of powder, and it makes a good hot bitter.

2. Take of golden seal half an ounce, poplar bark one ounce, black cherry bark two ounces, nerve powder a fourth of an ounce, and half a teaspoonful of cayenne; let them be pulverized and well mixed. To an ounce of this powder add half a pint of boiling water, one ounce of loaf sugar, and one pint of best Holland gin.

Dose, from half to a wineglassful, at discretion.

3. Take of balmony and poplar each two ounces, bayberry half an ounce, black birch four ounces; pulverize and mix well together, then work in a fourth of an ounce of cayenne and two pounds of sugar.

Take a teaspoonful of this compound night and morning, in a little hot water; or an ounce of it may be put into a gill of boiling water, to which add one pint and a half of good gin, or West India rum.

Dose, half a wineglass, two or three times a day.

SPICE BITTERS.

1. Take of fine poplar bark one pound, balmony seven ounces, bayberry four ounces, ginger four ounces, cayenne one ounce, cloves three ounces, golden seal three ounces, sugar two pounds, and let them be well mixed.

2. Take of poplar bark ten pounds, bayberry and balmony each two pounds, golden seal and cloves each one pound, cayenne half a pound, and sixteen pounds of sugar. Let these articles all be made fine and well mixed.

Put a tablespoonful of this compound with four ounces of sugar into a quart of boiling water. Take a wineglassful of this three times a day before eating. This is a good bitter. Or a teaspoonful of these powders with one of sugar, may be taken in a cup of hot water; or one ounce may be scalded in half a pint of hot water, and put into a quart bottle, which may be filled with good Malaga wine. Prepared in this way, it is an excellent bitter for weak patients.

WINE BITTERS.

Take one part of balmony and five of poplar bark, boil in water sufficient to strain from one pound two and a half gallons of water, to which add three and a half pounds of white sugar, and two and a half ounces of nerve powder while hot, strain and add three and a half gallons best Malaga wine and one quart each of the tincture of meadow fern and prickly ash seeds.

2. Take five pounds of poplar bark and one of balmony, boil them in 15 gallons of water, then add while hot, twenty pounds of sugar and one pound of nerve powder. Strain off and add four gallons of fourth proof Jamaica rum or brandy, twenty gallons of best Malaga wine, and one gallon each of tincture of meadow fern and prickly ash bark. When cool put it into a barrel and it is fit for use.

Dose, from half to a wineglassful three times a day.

RESTORATIVE AND RELAXING BITTERS.

Take one quart of beef's gall, one gallon best Holland gin, and one gallon molasses; mix and shake them well together.

Dose, a wineglassful at night or at discretion.

ASTRINGENT BITTERS.

Take of bayberry two pounds, of golden seal and ginger each one pound, cayenne and cloves each two ounces; all finely pulverized, sifted and well mixed. For dyspeptics with relaxed state of the bowels.

Dose, a teaspoonful in hot water sweetened.

DYSPEPTIC POWDERS.

Take of cayenne four ounces, golden seal half a pound, poplar bark four pounds and brown sugar eight pounds: let them all be made fine and well mixed, and then add one ounce of essence of pennyroyal, to be well incorporated with the other articles. This is good for distress occasioned

by food, for colic, flatulency and to remove faintness at the stomach. A teaspoonful may be taken in a cup of hot water, in boiled milk, wine, or when more convenient in a glass of cold water, or it may be eaten dry. It will remove chills, ague and cramps from the system, and is a a very valuable article to be kept on hand for use.

WOMAN'S FRIEND.

Take of poplar bark five pounds; unicorn, cinnamon, golden seal, and cloves, each half a pound; four ounces of cayenne and eight pounds of sugar. Let them all be made fine and well mixed. This is an excellent article in female weaknesses, to prevent abortion and to be used at the cessation of the menses.

A teaspoonful may be taken in a gill of hot water.

To Restore Digestion.

No. 5. THE DIFFERENT ARTICLES.

PEACH TREE—*Amygdalus Persica.*

This is an excellent article in a great variety of cases, among which are weakness of the digestive organs, disordered bowels, sickness at the stomach, for children when teething, and for worms. [See page 624.]

BLACK CHERRY—*Prunus Virginiana.*

This is one of the most valuable articles among our tonic remedies, and it also has the power of calming irritation and diminishing nervous irritability. [See page 626.]

BITTER ALMOND—*Amydalus Amara.*

Good in all cases of debility of the stomach and bowels. It may be used alone, or in combination with other articles. [See page 628.]

COMPOUNDS OF No. 5.

SYRUP FOR WEAKLY PATIENTS.

Take one pound each of the roots of elecampane, spicknard and comfrey, and half a pound of box-wood flowers; bruise them well together in a mortar, boil in two gallons of water one hour, strain and add while hot half an ounce of golden seal, two ounces of dyspepsy powders, four ounces of prickly ash seed, four ounces of gum arabic, the same quantity of allspice, two ounces of slippery elm bark, all finely pulverized, and eight pounds of loaf sugar; to this add one gallon good Holland gin and half the quantity of Madeira wine.

Stop it tight in bottles for use. Dose, from a fourth to a wine-glass full two or three times a day.

This is good for all female weaknesses, and is very strengthening to the loins and back.

SYRUP FOR WEAKLY FEMALES.

Take a large handful of green comfrey roots well cleansed and bruised; boil them in two quarts of water, strain off and press out the liquor, then grate in three nutmegs, add one ounce of dyspeptic powders, one pound of raisins pulverized, six pounds of loaf sugar, one pint of brandy and two

quarts of Madeira wine. When cool add six eggs that have been beaten fine, and let it be well stirred together.

This is a valuable article for female weaknesses. Dose, a wine-glass full three or four times a day.

SYRUP FOR DYSENTERY.

Take of bayberry bark and sumach leaves each one ounce, and boil in two quarts of water, one hour, strain off and add half an ounce each of golden seal and cloves, and when cool one pint of rheumatic drops. This is an excellent article for looseness of the bowels and indigestion.

Dose, from one to four table spoonsful three times a day.

SYRUP TO STRENGTHEN THE STOMACH AND BOWELS.

Take one pound each of poplar bark and bayberry, boil them in two gallons of water, strain off and add seven pounds of good sugar; then scald and skim it, and add half a pound of peachmeats or the same quantity of cherry-stone meats, pulverized. When cool add a gallon of good brandy, and keep it in bottles for use. Dose, half a wine-glass full two or three times a day.

This is an excellent article to strengthen the stomach and bowels and restore weak patients, and is particularly useful in dysentery. It is a good preventive as well as remedy for relax, dysentery, cholera morbus, &c.

MUCILAGINOUS SYRUP.

Take the pith of the roots of buckhorn brake, bruised; put them into a stone pot, and add water, either cold or hot; beat them with a spoon until it is of the consistence of the white of an egg. Pour off, and to one gallon add two pounds white sugar, one quart best brandy, two ounces caraway seed pulverized, and one glass of the volatile tincture.

Use, for weak nervous patients and child-bed women.

SYRUP FOR DYSENTERY, OR RELAX.

Make a strong decoction of bayberry, or in want thereof sumach, or marsh rosemary; strain, and while hot add to a gallon of the decoction two pounds of brown sugar. When cold add three pints of hot drops, (or enough to prevent its souring.) If necessary, add more of the hot drops when taken.

DYSENTERY SYRUP.

Make a strong decoction of equal parts of fine bayberry and sumach leaves. To one gallon of the decoction add two pounds of sugar, which has been dissolved, boiled and skimmed; one ounce of golden seal, and half an ounce of cloves. When cold add three quarts and a half rheumatic drops.

Dose, from a tablespoonful to a wineglass two or three times a day.

SYRUP FOR RELAX, OR SUMMER COMPLAINT.

Take of poplar bark, black cherry bark, of the green root, and balmony, each one pound; of golden seal and hops, each half a pound; boil these ingredients in eight gallons of water, and strain off; then scald and add twenty-five pounds of white sugar; take off the scum, and add while hot, a pound of cloves. When cool, add two gallons of rheumatic drops.

Dose, for an adult, from half to a wineglassful, at discretion.

ANTIDYSPEPTIC RESTORATIVE.

Take of poplar bark five pounds; of golden seal and ginger, each two

pounds; of balmony, umbil, cloves, unicorn, cinnamon, and cayenne, each one pound; of white sugar fifteen pounds; let them all be pulverized and well mixed.

Dose, a teaspoonful, in a tumbler of hot water, sweetened.

FOR WINE BITTERS—Take an ounce of the above powders, scald them in a half pint of hot water, put them into a quart bottle, fill it with best sweet Malaga wine, and add sugar at discretion.

Dose, from half to a wineglassful, three or four times a day.

ANTIDYSPEPTIC CONSERVE.

Take one pound of fresh blossoms of hollyhock, or of dry ones moistened to the same consistence as the green, pound them well together in a mortar; then add four pounds of white sugar—pound until a paste is formed—then knead or work in with a pestle the following powder, made fine: two pounds each of poplar bark and ginger, half a pound each of golden seal, balmony, cloves, slippery elm bark and cayenne. When it becomes of the consistence of dough, add a fourth of an ounce of pennyroyal, well mixed. Make it into a loaf, or pills, or any other form you wish, and let it dry for use.

A piece of this may be dissolved in the mouth, and swallowed with the saliva. It will answer as a good substitute for tobacco. This is a powerful antidyspeptic agent, and an excellent article to be used by people of weak, debilitated, and consumptive habits. The spring is the best time to try its beneficial effects. People then are apt to feel weak and faint, from the imperfect digestion of their food, produced by the change in the atmosphere or other causes.

The use of this article will give tone to and brace up the stomach, and impart to a person a vigorous and lively sensation.

Antiseptic and Stimulant.

GUM MYRRH—*Balsamodendron Myrrha.*

Myrrh is the most powerful antiseptic known, and is on that account highly serviceable in all putrid affections whatever. It is almost a certain remedy for cholera, and all cases of putridity of the bowels. It is good in female obstructions, difficulties of the lungs, and for weak joints, sprains and bruises. Combined with alcohol and cayenne is the most usual form of using it. [See page 629.]

No. 6. RHEUMATIC OR HOT DROPS.

IMPROVED RHEUMATIC DROPS.

1. Take one gallon of high cherry spirits, one pound gum myrrh, four ounces golden seal, four ounces bayberry, one ounce cayenne; mix and shake once a day for several days. The solid articles must be pulverised.

2. Take one pound of gum myrrh pulverized, and one ounce of fine cayenne; simmer them for twenty or thirty minutes in one quart of sweet wine, this will decompose the myrrh rapidly. Then add two ounces of pulverized prickly ash seeds, one ounce tincture of camphor, one gallon of West India rum, and four pounds of fine loaf sugar. This is an excellent article for all kinds of sprains, for a weak back, &c., to be bathed

on and taken internally. It is also a valuable remedy for relax, dysentery, &c.

3. Take one gallon of any kind of high wines, one pound of gum myrrh made fine, and one ounce of cayenne; put them into a stone jug and boil it for a few minutes in a kettle of water, leaving the jug uncorked. It may be prepared without boiling by letting it stand and shaking it two or three times a day for a week, when it will be fit for use.

These drops are to remove pain and prevent mortification, either internally or externally applied.

Dose, from a tea to a tablespoonful in a little hot water, or given in other medicine.

They may be used to bathe with in all cases of external swellings or pain. It it an excellent remedy for the rheumatism, in which case take a teaspoonful and bathe the parts affected. It will relieve headache by taking a dose, bathing it on the head and snuffing it up the nose. It is good for bruises, sprains, swollen joints, and old sores; it will allay inflammation, reduce swellings, ease pain and produce a tendency to heal. There is scarcely a complaint in which this may not be used to advantage. It is the best preservative against mortification I have ever found.

For bathing, in rheumatism, itch, or for any other external application, add one quarter part of spirits of turpentine; and for sprains or bruises, a small quantity of camphor and nerve ointment may be added.

COMPOSITION POWDERS—*First Preparation.*

Take of bayberry two pounds, ginger one pound, cayenne and cloves each two ounces; all finely pulverized and well mixed.

Second Preparation.

Take of bayberry, ginger, poplar and hemlock bark each one pound, of red or white oak bark half a pound, three ounces of cayenne and two of cloves, all finely pulverized and well mixed.

Third Preparation.

Take two pounds each of bayberry and ginger, one pound each of poplar and oak bark, three ounces of cayenne and two of cloves, all finely pulverized and well mixed.

DIRECTIONS FOR USING.

Let either of these compounds be taken for canker and to promote perspiration, the patient being shielded from the air. Dose, a tea-spoonful in a cup of hot water, sweetened.

This is for the first stages and less violent attacks of disease. It is a valuable medicine, and may be safely employed in all cases. It is good for relax, pain in the stomach and bowels, and to remove all obstructions caused by cold. A few doses of this, the patient being in bed, with a steaming stone at the feet, will cure a bad cold, and usually throw off disease in its first stages.

Nervines.

LADIES' SLIPPER—*Cypripedium.*

This is an excellent article in all spasmodic nervous or hysterical affections. It is entirely destitute of narcotic properties and may be used

with freedom and safety in all cases of disease. After its operation the patient feels cheerful and happy in both body and mind. [See page 632.]

ASAFETIDA—*Ferula Asafœtida.*

This article is powerfully antispasmodic expectorant and feebly laxative. It is very useful in the treatment of hypochondria, hysteria, convulsions, spasms and all cases of nervous debility. From the union of its different qualities it is an excellent article in all difficulties of the lungs. It may be substituted for the foregoing, and is also a valuable article in constipation and flatulency. [See page 634.]

CAMPHOR—*Laurus Camphora.*

This exerts a considerable influence over the brain and nervous system. It increases the heat of the surface, promotes perspiration, strengthens the pulse and allays nervous irritation. It expels wind from the stomach and may be used as a nervine when the asafetida and valerian cannot be had. [See page 636.]

Note.—Holland gin is an excellent nervine and may be used in all cases of nervous irritability with good effect. Let it be prepared in form of sling, and taken hot on going to bed.

SKUNK CABBAGE—*Ictodes Fœtidus.*

This is an antispasmodic stimulant and narcotic, and is good for all affections of the lungs, hysteria and rheumatism. It is a valuable remedy for coughs and dropsy. [See page 638.]

BITTERSWEET—*Solanum Dulcamara.*

It has the power of increasing the secretions of the kidneys and skin, and in large doses produces narcotic effects. It is useful in mania and also in cutaneous affections. An ointment is made from it very useful to remove stiffness of the joints and callouses, and also for sprains and relaxed or contracted muscles. [See page 639.]

Antiscorbutics.

BURDOCK—*Arctum Lappa.*

This root is sudorific, diaphoretic and aperient, without irritating properties, and is a valuable remedy for all scorbutic affections. The seeds are diuretic and may be profitably employed where such articles are necessary, and also to cleanse all impurities from the blood. The leaves are useful in drafts and may be applied to the feet or any part of the body suffering with pain. [See page 641.]

BLACK SNAKE ROOT—*Macrotys Serpentaria.*

This is a very useful article in rheumatism, dropsy, affections of the uterus and pulmonary consumption. It exerts a great influence over the nervous and arterial systems, and increases the secretions of the kidneys and skin. [See page 643.]

PIPSISEWA OR PRINCESS PINE—*Chimaphila Umbellata.*

Its active properties are antiscorbutic, tonic and astringent, and is good

in rheumatism, scrofula, affections of the kidney and all scorbutic difficulties. [See page 644.]

GREEN OSIER—*Cornus Circinati.*

Good for all kinds of inflammation, especially of the eyes. It strengthens the stomach and removes scorbutic difficulties. [See page 646.]

DOCKS—*Rumex.*

Very useful in scorbutic disorders and cutaneous eruptions. They are antiscorbutic, aperient and tonic; good in all cases where any articles under this head may be used. [See page 648.]

PRICKLY ASH—*Xanthoxylum Fraxineum.*

This is an antiscorbutic, antispasmodic, stimulant and diaphoretic; good for coldness in the extremeties, chills, inflammation in the face, toothache, &c. [See page 650.]

YARROW—*Achillea Millefolium.*

Internally, yarrow is useful in nervous affections, colic, and intermittent fevers; externally, for all kinds of inflammatory sores, salt-rheum, cracked hands and piles. [See page 652.]

LOVAGE—*Ligusticum Levisticum.*

Good for scrofula, venereal, rheumatism, and female obstructions. [See page 652.]

CUBEBS—*Cubeba.*

This is a grateful tonic, stomachic and regulator of the digestive organs. It is also a useful remedy in gonorrhœa and first stages of syphillis. [See page 653.]

MEADOW FERN—*Myrica Gale.*

Useful in salt-rheum, tetter, itch, and all poisonous eruptions of the skin. [See page 649.]

FERN OINTMENT.

Take of the leaves of meadow fern, the buds of balm of Gilead, and gum myrrh, of each equal parts; simmer in fresh butter, and strain. Let it be hardened with bayberry tallow and rosin.

DRINKS FOR BAD HUMORS.

Take four ounces each of the following articles: burdock seeds, princess pine, sarsaparilla and sassafras; let them all be dry, finely pulverized and well mixed. Steep one tablespoonful in a pint of hot water, and let it be used as a constant drink.

DECOCTIONS OF SARSAPARILLA. FOR THE BLOOD.

Take of sarsaparilla root six ounces, soft water one gallon. After macerating in boiling water for two hours, then take out the root and bruise it; add it again to the liquor, and macerate it once more for two hours; then boil down the liquor to four pints, and strain it. Take from a gill to half a pint daily, or more if thought advisable.

COMPOUND DECOCTION OF SARSAPARILLA.

Take of sarsaparilla root, cut and bruised, six ounces; the bark of sassafras root, lignum vitæ dust (*guaiacum wood*) or shavings, liquorice

root, of each one ounce. Bruise them well together, and put them into five quarts of water, and let it steep over a gentle fire for six hours; then boil down the liquors to one-half or to five pints,and strain off.

The dose is, from one gill to half a pint daily, and to be taken for all bad humors.

These decoctions are of very great use in purifying the blood, and resolving obstructions in scorbutic and scrofulous cases; also in cutaneous eruptions, and many other diseases. Obstinate swellings, that have resisted the effects of other remedies for upwards of twelve months, have been cured by drinking a quart of this decoction daily for some time.

Decoctions of sarsaparilla ought to be made fresh every day, as they very soon become fetid and unfit for use.

While taking this tea, the courses of medicine may be used with great advantage.

ANTISCORBUTIC DRINK.

Meadow fern leaves and burs, bruised and made into a tea, are very useful in cleansing the blood of all humors. For this purpose, it is more valuable than sarsaparilla.

Powerful Antiscorbutic Ointment

TOBACCO OINTMENT—OR UNGUENTUM TABACI.

Take half a pound of the leaves of tobacco, one pound of dock roots, one pound of lovage root; bruise the leaves and roots in a mortar, and put them into two gallons of soft spring, or rain water; boil for one hour, strain off, press the grains and simmer the liquor down to the thickness of molasses, then add two pounds of fresh lard, four ounces of beeswax, and four ounces of burgundy pitch; continue a moderate heat just sufficient to dry away the moisture, and unite the compound into an ointment for use.

This is the most powerful antiscorbutic ointment that I have ever become acquainted with. I first observed the salutary operation of this valuable ointment, in a case of saltrheum of six years standing, upon the Island of Nantucket. The sore embraced the whole back part of the head from the crown to the neck, and from ear to ear. So severe was the irritation, that the hands of the child were muffled to restrain him from tearing the skin seriously with his finger nails. Notwithstanding the hands were shut and a strong cloth put over and tied fast about the wrist to keep his fingers thus closely confined, on going to bed he would turn upon his face, and with his hands thus muffled, rub off the scabs from the whole surface of the sore, and the blood and water would course their way down to the back of the neck, staining the shirt and bed clothes very much with the foul ulcerous matter.

The best medical assistance in the place had been employed for three or four years, but to no advantage; the parents completely despairing of the child's finding any benefit, except in time they thought he might out grow it.

By the application of this ointment the sore was healed entirely in three weeks. In a month or two after, it broke out again, about as large as a cent; the ointment was again applied and the sores healed. It is now about eighteen years since, and the sores have not again broken out to the knowledge of the writer.

A second case of the same complaint I had about one year after the one before mentioned, which was the most violent of any I ever saw, as there was not a particle of the natural cuticle or skin to be seen above the chin; in fact the whole surface of the head was one solid mass of corruption; also the joints of the shoulders, elbows, wrists, hips, knees, and ankles. The only sound skin was to be found on the body and between the joints. The child had been afflicted with this complaint near three years. The mother had employed the best physicians in the place, and they had given their unremitting attention to the case for about two years without any perceptible benefit.

The mother having heard of the case of the boy whose head I had previously cured, as before mentioned, after being afflicted six years, she went to see the child, and examined the head, for her own satisfaction. On her return home I was sent for. I went immediately to the house, and after the usual salutation on entering, the lady, who was a quakeress, said—Is thee Doctor Thomson? That is my name, I replied. Well, I have been to see Coffin's child, whom thee cured of the salt-rheum, and am so well satisfied with thy practice in that case, that I have sent for thee to see if thee can render me a like service in the case of my child. There is the poor distressed object, (pointing to the cradle) not sick at heart, but see the dreadful state of his face. I have had Dr. G. to attend to the child for about two years past, and I will give thee six months to effect a cure, and no longer.

I remarked, that I thought she ought to give me as great a length of time as doctor G., if I effected the cure: but not so—six months was my limit. She said that Dr. G. was an old friend, or he would not have been favored so long.

I made the commencement, and in three months the sores were entirely healed, and the face, body and limbs, were without a scar; and it appeared to me to be the fairest complexioned child I ever saw. The operation of the medicine seemed to improve the child both in strength and color of the skin.

I have cured a number of other cases of salt-rheum and scorbutic ulcers with this ointment.

PREPARATION OF THE OINTMENT BEFORE USE.

Take a lump about the size of a walnut, and mix it well with a table-spoonful of hog's lard, or about three parts of lard to one of ointment. Then give the patient some prepared composition, hot drops, or something to warm the stomach. Then wash the parts affected by the disease with warm soapsuds, to cleanse the same; dry them off with a cloth, and take a portion of the ointment about the size of a pea and rub it over them, and so continue until the whole surface of the sores is saturated. Increase the strength of the ointment daily until you are enabled to apply it in full force.

In a few minutes after the application, the patient will begin to look pale, grow sick at the stomach, and will vomit profusely, if the ointment is of sufficient strength, by which means the whole system, both internally and externally, will become cleansed by its use. I think this ointment the most powerful antiscorbutic that can be applied to the surface of the body, as it purifies the skin and blood at the same time, of the sharp acrid humors.

Those who have cutaneous eruptions which they wish to be rid of, will never regret the application of this remedy; but they must not mind the temporary sickness which it will certainly create, as there is no danger, that I have ever known, to arise from its effects, which are the same pre-

cisely as are experienced from the seed of the lobelia or the brown emetic when under a course of medicine.

This ointment may be applied to the neck and hreast of children to good advantage in cases of the croup. It is also good for old ulcers, fever sores, and for tetanus, or lockjaw, by bathing the parts affected, and drying it in by the fire. It is excellent to bathe joints, or contracted muscles.

There is no sore upon the surface where this ointment may not be usefully applied, especially if it cannot be healed with other remedies usual in such cases.

Take a bath three or four times a week and cleanse the surface, as directed under the head of "*Treatment of the Surface.*"

N. B. Never be frightened at the effect of this ointment, as there is no danger if the stomach is kept warm and well nourished with gruel.

The antiscorbutic tea may be used daily while the ointment is being applied.

TREATMENT OF THE SURFACE AFTER TAKING A BATH.

For the benefit of scorbutic patients.

After having taken a bath and filled the extremities with an active circulation of blood, which may be known by the fulness of the veins, pour over the whole body a quart of water, with the chill removed sufficiently to leave it gently tepid, or about the temperature of the air. Then rub the body with a napkin severely, so much so as to create a cutaneous excitement and a warm glow throughout the whole exterior system. Then take four ounces of the tincture of lobelia, and dissolve as much saleratus in it as it will bear. Pour over the body a quantity of this preparation, and rub it in with the hands, and upon the limbs also, and it leaves an agreeable genial glow, that is very pleasant to the person who experiences the operation. It clears the capillary vessels, and is an excellent thing to correct morbid obstructions of the perspiration.

Where the external surface is dry and inert after bathing, and applying the cold or tepid water as above directed, the rheumatic liniment may also be used thoroughly over the body, the same as the tincture was applied, causing a lively and pleasant glow, that is very useful to promote perspiration, for dyspeptic, rheumatic and dropsical habits

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ANTISCORBUTIC POULTICE,

For Fever Sores, Whitlows, Biles, Old Ulcerous Sores, King's Evil &c.

To half a pint of hot water, add two heaping tablespoonsful of fine salt and one tablespoonful each of cayenne and brown emetic, well pulverized; stir them well together, and add one gill of soft soap, one tablespoonful of ginger, the same quantity of slippery elm and sponge crackers, and wheat bread or Indian meal sufficient to make it of a proper consistence.

When this poultice is applied, keep it moist by occasionally wetting it with a teaspoonful of water, or dipping it into water. Hot medicine should be freely taken, to prevent the difficulty from striking to the stomach, and to prevent faint sinking sensations, and loss of appetite.

For fever sores, old ulcers, rheumatism, &c., this remedy has not its equal, to our knowledge.

When there is much distress and a high state of inflammation, and the sore is not yet opened, much relief will be obtained by burning a piece

of punk upon the part (see caustics, page 679,) and then applying this poultice. Almost immediate relief from distress will be the result.

A course of medicine at this time, to equalize the fluids of the body, will be attended with the most beneficial results. We have cured with this poultice, in connection with courses of medicine, a case of hip disease of twenty-seven years standing, several fever sores and bad ulcers, besides dispersing or scattering many that had commenced, on various parts of the body.

A very bad scorbutic difficulty was cured upon a young man's neck, extending from the shoulder across the breast and up the side of the neck, to the upper jaw and right cheek. This case had been given over by the regular faculty as incurable, but we restored him to good health by the use of this poultice, accompanied by courses and the antiscorbutic syrup (see page 642).

OUTWARD APPLICATION,

WHILE USING THE ANTISCORBUTIC DRINKS.

Make as strong a tincture of lobelia inflata as you can, by boiling it in water and then putting it into spirits. Add a teaspoonful of saleratus to every four ounces, and with this wash the parts affected. At the same time make a daily use of the drinks, and the good effects will soon be visible. After taking a vapor bath, let the whole body be bathed with this article.

TO CURE TETTER IN THE FACE, OR BARBER'S ITCH.

Wash the face with pure lime water or a lye made of hard wood ashes; let it dry, then neutralize the alkali by washing with good vinegar. The lye kills the insect, and by timely application the vinegar prevents the corrosive effects of the alkali. If the system is much impregnated with the scrofulous affection, use freely of the antiscorbutic syrups, or drinks to cleanse the blood.

Cathartics.

We wish our remarks in relation to cathartics, on page 654, to be remembered, as we do not wish Dr. Samuel Thomson to be held accountable for what we may say in relation to this matter. We may honestly differ on this subject, but perfectly agree that if people will take such medicines, let them be of the most gentle kind, such as peach leaf tea, pepper pods, beef's gall, castor oil, or senna, instead of *calomel, croton oil, gamboge,* and other powerful and poisonous drugs.

NOTE.—Drastic cathartics should be used in no case where there is danger of mortification. The gall cathartic or oil may be used to advantage, compounded with rheumatic drops or gin sling, in case of relax or dysentery. Thus compounded, they soothe the bowels, and give quiet to the arterial and nervous systems, producing sleep and rest to the patient.

THE NATURAL PHYSIC FOR THE BODY.

After the natural physic of the body which is the gall, has exerted its

powers and has failed in producing that healthy action in the stomach and bowels that is so necessary, the next nearest to the natural physic should be used. Cathartics should never be used if we have any more effectual remedy. After the gall fails in producing action we must substitute art. Rye and Indian bread is an excellent remedy; let it be constantly used for a time, and for a change if necessary, substitute the bread made from unbolted wheat. Another good remedy is a greening apple to be eaten after each meal. This will keep the bowels in regular order longer than any other fruit kind that can be preserved. I am acquainted with an old gentleman in this city whose age is between 70 and 80 years; he is a master builder, and is actively engaged in his profession, and to appearance you would not suppose him over 55 or 60 years of age. He takes no physic, but always after dinner you will see him eating his juicy greening apple, which he thinks is the best physician he can employ. This man has quite a florid countenance and lively eyes, which have a great antipathy to doctors. This case is a practical monument of the salutary effects of the greening apple upon the bowels. I here take the liberty to recommend for the good of others his practical knowledge on himself. In a number of cases I have seen the good effects of apples for costiveness.

ANIMAL PHYSIC—BEEF GALL.

Take 1 quart of beef gall, put it into a glass bottle of 3 or 4 gallons, then add one gallon of the best Holland gin, and one gallon of the best sugar house molasses; shake it well together and scent it with pennyroyal. This is an excellent corrector of the digestive organs, and well calculated to remove constipation of the bowels and restore their natural action.

APPLICATION.

Take from half to one glass night and morning. It will correct the digestion and remove the costive state of the bowels, by which means the appetite is sharpened, the circulation quickened in the extremities, and thus regulating the nervous system, thereby making the mind cheerful and the body active, and establishing a regularity through the system that renders life pleasant and a blessing.

Beef gall may be dried down and made into pills and used to great advantage; or it may be mixed with bitter root or golden seal, which makes a very valuable pill.

PEPPER PODS.

Take at night on going to bed from 4 to 10 cayenne pepper pods and they will generally operate during the night or next morning. The operation of these pods upon the bowels of dyspeptics produce happy effects upon the mind, as they carry warmth and activity with them, diffusing a lively sensation through the lower extremities, equalising the circulation throughout the body, and loosening the head from the many bands that have apparently kept the mind in bondage from the time the costive habit commenced. From which time the feet became cold to excess, in the same proportion as the head became excessively hot and oppressed from the additional circulation from the feet, which was forced to the head by the torpidity of the bowels. When the bowels become right again, the feet and stomach warm and active, and the head cool as usual when in health, order will reign once more throughout the whole body. [See page 590.]

PEACH—THE FRUIT, LEAVES, FLOWERS AND BARK.

Take one ounce of peach flowers or leaves and put them into three gills of water; let it simmer at a moderate heat for half an hour; strain off and sweeten it with sugar and add a little milk. Take half at night and if necessary take the balance in the morning. This infusion is an excellent corrector of the digestion, especially for children when teething, and for all kinds of derangement of the bowels for either old or young. The properties of the peach leaves are much the same as the pit or kernel. A free use of ripe and mellow peaches will produce the same effect upon the bowels. Children who are troubled with a bad state of the stomach and bowels, and of feeble constitution, should make free use of ripe peaches, and a great benefit will be derived to the constitution. The peach bark may be used for the same purpose, when neither the flowers, leaves nor peaches can be had. See page 624.

CATHARTIC COMPOUND.

Take four ounces bitter root, eight ounces peach leaves and eight ounces butternut bark. Bruize the articles fine in a mortar. Put them into a brass kettle, and add one gallon of soft spring or rain water, boil it down to about half a gallon, then strain off and press the grains. Clean out the kettle, and then boil it again down to about one pint. Let it stand for 12 hours and settle; pour off the clear liquor, and to this decoction add a like quantity of fourth proof brandy, and the same quantity of molasses. Put it into a glass bottle or stone jug, stop it tight and shake it well, and it is fit for use.

APPLICATION.

Take a tea-spoonful about three times a day, twice a week, and it will remove flatulency and restore order where disorder was prominent before in the bowels. The stimulating effects of the butternut will remove almost all kinds of cholic pains. Judgment should be used in its application, or it may produce a reaction in the bowels, and a costive habit more violent than before. Increase or diminish the quantity according to judgment.

BITTER ROOT—*Apocynum Canabinum.*

The Apocynum or bitter root may be used to good advantage in dyspeptic habits. To remove costiveness, it has not its equal in the vegeta. ble *materia medica.* It may be taken half a tea-spoonful in a little hot water, in composition or in the dyspepsia powders prepared, and in fact in any manner that it can be most conveniently swallowed without sickening the stomach.

For confirmed dyspeptics, where artificial means must be used to produce action in the bowels, this article may be used with great satisfaction to the patient; for when taken in small quantities, say quarter of a tea-spoonful three or four times a day, it will require some days for the powerful correction properties to be made manifest, and then they are satisfactory.

BUTTERNUT—*Juglans Cyneria.*

The extract of the butternut bark I have used in a great variety of ways. It is a powerful auxiliary in the third preparation, in cramps, convulsions, and in all cases of suspended animation. I first used this compound in Montreal, in cases of cholera in 1832, and was well pleased with its lively, searching and stimulating effects, as it would start a moisture in the palms of the hands in a very few minutes, relieving all pains

and cramps in the extremities in much less time than the preparation without it.

It may be used for compounding emetic pills, together with brown emetic, cayenne, nerve powder, or composition. Regulating the strength of the pills by judgment.

The pills may be made with a little No. 2, and used for cholic pains, but by being often repeated, the cathartic properties are lost, and a severe costive state of the bowels succeeds the operation. Therefore, as a cathartic, it should be used with caution. A tea made of the green bark sweetened, will generally relieve the cholic at once.

CASSIA MARILANDICA—*American Senna.*

This article I have always used in connection with sage and ginger. From its operations I have witnessed the most salutary effects in cases of violent attacks of typhus fever. In one family on the island of Nantucket, where three members had died (two sons ane one daughter,) one in seven, one in eleven, and the last in four days, all of whom were laboring under a high state of derangement from the time of the attack, until death, was the cause why the father commenced with me at the time the fourth child was taken sick. The typhus fever was epidemic and very fatal that season, and the regular practice was attended with bad success. The patients were attacked in the back of the head, neck, and small of the back, and immediately lost their senses, from which time the scene was a solemn one indeed. I had five patients in the same family, three of which were of the typhus fever. My commencement was to put half an ounce of sage, half an ounce of senna and one tea-spoonful of ginger together, and steep them in half a pint of hot water ten minutes, and let the patient drink half of the tea. This relieved the pain in the head and back as soon as it operated; they had no more pain, and the medicines thus restored them to health in a short time, without the loss of reason for a moment. [See page 656.]

OLEUM RICINI—*Castor Oil.*

I have found castor oil to be very good for children, when the bowels have been out of order. Also for grown persons, but in all cases let a little composition powders be used to warm the stomach and bowels, if necessary to remove pains.

I have frequently given my children castor oil in warm gin sling sweetened, which by the way is as good a method as can be adopted. The gin, from its quieting effects upon the nerves, subdues all pain and luls the patient to sleep.

After such an operation, or at the time the oil is doing its office, the composition, cayenne or any other hot medicine may be use dto do away the pain, if any, that may attend the operation. Oil may be judiciously used in boiled milk, with part of a glass of gin, when a person is troubled with the piles. The operation of which is admirable, as the person can retire to bed and go quietly to sleep. For a grown person, put half a glass of oil into one glass of sling; stir it well when taken. A child may take a table spoonful in half a glass of hot sling, to be regulated according to the age. I have found this course much more convenient than using the the syringe, and certainly much more to the satisfaction of the patients, if I was away from home. [See page 657.]]

SUITABLE PHYSIC

For those troubled with Gravel, Stranguary, or Urinary Difficulties.

Take of castor oil two tablespoonsful, and boiled honey two teaspoonsful, put them into a teacup that has been warmed by being in hot water or

near a fire; the warmth of the cup will make the oil and honey very thin, which must be stirred well together and taken. This is a dose for a grown person, which may be graduated in all cases to suit the age. A dose of composition may be given about the same time; this will carry life and vigor through the bowels and urinary passages, and is not surpassed by any other cathartic we have ever used. Aside from its cathartic properties, it is very useful in gravel and all disorders of the kidneys.

PHYSIC. *Rhamnus Catharticus.*

Buckthorn Berries for a cathartic, may be used to good advantage when no other remedy is at hand, and physic is required. They possess the most powerful bitter that I am acquainted with, except the bitter root, but have some corrective qualities that make them sometimes useful.

APPLICATION.

Take from five to ten, and from that to fifteen or twenty, or even as high as forty or fifty for rugged men, have been used before an operation has been produced. But generally from ten to twenty are a sufficient dose. They may be taken at night, on going to bed, or at any other time that the circumstances of the case may require. They produce little or no pain, hence they are more valued than drastic purges, and are attended with none of the bad consequences peculiar to some other kinds, which produce nearly as much pain as they are taken to remove.

POWERFUL STIMULATING PHYSIC.

Take of mandrake root and butternut bark, each half a pound; bruise these articles well in a mortar together, and boil it in half a gallon of soft spring or rain water, to one pint. Strain off and press the grains. Add equal quantities of molasses and fourth proof Jamaica rum. Put it into a glass bottle and shake it well together; stop it tight, and it is fit for use.

APPLICATION.

Take one tablespoonful for a grown person, and a teaspoonful for a child; it causes no pain. This has proved of great value in many costive habits, for colics and distress in the head, when it is caused by constipation of the bowels.

WHEN SHOULD CATHARTICS BE TAKEN.

Physic should not be given if thought advisable until twelve hours after a course of medicine, and then the hot medicine should be freely used, to keep up internal action sufficient to overcome the bad effects, if any, arising from its use.

LAXATIVE PILLS.

Take one ounce poplar or peach extract, half an ounce of rhubarb, half an ounce Castile soap, half an ounce of bitter root and half an ounce of dried beef's gall; work this compound well together and add a little No. 2, or cayenne. If it is not stiff enough to pill, work in rhubarb and bitter root, of each equal quantities, till it be of sufficient consistency for pilling. Make it into pills. Take from one to three at night; they will regulate the bowels and ease the head of unnecessary pressure and confusion.

These pills are gently laxative, and innocent, where people wish cathartic medicines; and will obviate the necessity of any calomel, or any other powerful poisons.

Diuretics.

STRAWBERRY—*Fragaria Virginiana.*

This is a valuable diuretic, to be used in stranguary, gravel, and difficulties of the kidneys. It is also diaphoretic, moderately tonic, and astringent. [See page 660.]

CLIVERS—*Galium Aparine.*

A powerful diuretic, emmenagogue, stimulant, and diaphoretic; to be used in cases of calculous ulcerations, gravel, urinary difficulties, and female obstructions. [See page 661.]

WILD LETTUCE—*Lactuca Elongata.*

A good remedy for complaints of the kidneys and bladder, also for dropsy, scorbutic difficulties, and costiveness. [See page 662.]

PARSLEY—*Apium Petroselinum.*

Parsley is good for dropsy, gravel, and obstructions of the liver and kidneys. [See page 663.]

DANDELION—*Leontodon Taraxacum.*

This is a good article to be applied as a remedy for derangement of the digestive organs and the urinary apparatus. It is good in chronic inflammation of the liver, and also operates as a hydragogue. [See page 664.]

JUNIPER—*Juniperus Communis.*

Useful in all difficulties of the kidneys, stranguary, dropsy, gravel; and in cutaneous and scorbutic affections. [See page 666.]

RECEIPT FOR DROPSY, STRANGUARY, GRAVEL, &c.

Take several water-melons and bruise them fine, then put the macerated pomice into a flannel or canvas bag and submit it to a heavy pressure, to extract the juice, which do to the amount of two gallons; then simmer it down to one, and skim it. After this add four pounds of boiled honey, and the whole substance of eight good lemons, well bruised. Put this into a stone jug, add an ounce of fine barberry bark and half an ounce of fine bitter-root (after scalding them in half a pint of boiling water to extract their strength); two ounces each of fine mustard and ginger, one pound of water-melon seeds bruised fine, and half a gallon of first quality of Holland gin. Let this compound be shaken together daily for a week, and stopped tight for use.

Take from half to a glass, from three to six times a day, as the patient is able to bear it.

When peaches can be had, the fine pulp of half a peck of the first quality may be added, with more melon juice and gin, according to judgment, if the compound be too thick. This remedy needs no commendation as to its value. The proof is in its application.

FOR DROPSY.

Take four ounces each, of sassafras, prickly ash, white sumac, and white pine; bruise and boil in two gallons of water down to a quart,

strain, and add one pint of best Holland gin and two ounces of fine mustard seed.

Dose, a gill, three times a day.

While using this, bathe the feet at night in hot water, as directed on page 692, with the use of stimulating liniment.

HONEY A REMEDY FOR THE GRAVEL.

By using half honey and half sugar to sweeten the tea and coffee taken at meals, cases of gravel may often be cured, without any other treatment.

A better remedy, however, is to make a strong decoction of pipsissawa, to which add for every quart a pint of good Holland gin, and sweeten it well with honey. This is valuable in all complaints of the kidneys.

Dose, a wineglassful three times a day.

FOR OBSTRUCTIONS OF THE KIDNEYS OR BLADDER.

Take half a pound each, of pumpkin seeds, parsley roots, hemlock boughs, poplar bark and clives, 4oz. ginger; boil this compound in two gallons of water down to one; sweeten with honey, and add half a gallon of best Holland gin.

Take a wineglassful once an hour till relief is obtained. While using this, a steaming stone may be placed at the small of the back.

DIURETIC BEVERAGE.

Cranberry vines in decoction are good to promote the discharge of urine. Whortleberry bushes and fruit used in the same way are good for gravel and stoppage of the urine. Parsley roots, leaves and seed, are also good for the same purposes, to be used as above. A tea may be made of the articles, and used as a constant drink.

DIURETIC COMPOUND.

Pure new cider is an excellent diuretic, and may be profitably compounded with other articles for that purpose, as follows: Put into a two gallon jug, one and a half gallons of cider; then take half a pound each of mustard seed and horse radish roots, made fine, and four ounces of good pure ground ginger; put these articles into a quart of pure new cider and steep them for ten minutes; when cool, add it to the contents of the jug, and shake it well together.

Dose, a wineglassful several times a day. It is a great diuretic, and is excellent for the dropsy.

A STRONG DIURETIC DRINK, FOR URINARY DIFFICULTIES OR DROPSY.

Take a water-melon, bruise it fine and press out the juice; sweeten it with boiled honey, and then add the substance of one lemon, and enough Holland gin to keep it from souring. Let this be used as a common beverage.

A large quantity of this juice may be prepared in the same way in the season of melons, and preserved for use. The substance may be reduced by boiling down the juice to the consistencey of molasses, and preserved with honey and gin.

Of this, use one teaspoonful or more, in a tumbler of soft water, several times a day. In diseases of the kidneys, costiveness, liver complaint and asthma, this article will produce a beneficial effect.

SWEET ELDER TREE—*Sambucus Canadensis.*

It has been remarked, that this tree is a whole magazine of physic for rustic practitioners.

A syrup may be made of the ripe berries, with the addition of peach-meats or cherry-stone meats, with brandy sufficient to preserve it, which is an excellent strengthening and restoring medicine.

The berries may also be made into wine, which tastes much like that made from grapes.

The bark and young shoots given to sheep, will cure the rot. The buds and young tendrils make good pickles.

By whipping fruit trees with the green leaves, it will prevent insects from troubling them.

An infusion of the leaves in water, sprinkled over rose buds and flower beds, will preserve them from caterpillars.

The white or sweet elder is the kind used.

FOR A SUPPRESSION OF URINE,

Take a little spirits of turpentine—a few drops upon sugar, or compounded with honey or in any other way.

TO CURE DIABETES,

OR A CONTINUAL VOIDING OF URINE.

Take rosin and loaf sugar in equal quantities, well pulverized. Dose, a teaspoonful, three or four times a day.

This will soon put a stop to the complaint, unless the system is much reduced; then remedies should be used to restore and regulate the action of the stomach and bowels. Keeping up a gentle perspiration will usually relieve the patient; if not, the tincture of kino may be given, in teaspoonful doses, in composition tea or hot water, from two to six times a day.

Mucilaginous Substances.

FOR POULTICES AND INTERNAL USE.

YEAST—*Cherevisiæ fermentum.*

Yeast is an excellent article to be used in cataplasms or poultices on all inflammatory sores, bruises, broken limbs, putrid ulcers and sprained joints. It may also be internally used in dysentery and all cases of putridity of the bowels. Its effect is very cooling, soothing, and agreeable. [See page 667.]

SLIPPERY ELM—*Ulmus fulva.*

This is a valuable article in dysentery, diarrhœa, and diseases of the urinary passages. In poultices it is very servicable to apply to inflammatory sores, burns, freezes, and all kinds of ulceration. [See page 668.]

BUCK-HORN BRAKE—*Osmunda regalis.*

This is good in dysentery, or a sore, tender state of the stomach and bowels, and is also very servicable in female weaknesses and general debility. [See page 669.]

BENNE PLANT—*Sasimum orientale.*

This article is good in diseases of the bowels and urinary passages, and may be also profitably employed in poultices for burns and inflammatory sores. [See page 670.]

HOLLYHOCK—*Althæa rosea.*

Hollyhock is good for soreness in any part of the alimentary canal, and may be substituted for slippery elm in poultices. [See page 671.]

RED CLOVER—*Trifolium pratense.*

Good for cancers, old sores, sore lips, and scorbutic difficulties. [See page 671.]

WILD TURNIP—*Arum Trifilum.*

This article stimulates the secretions of the lungs and skin, and is good for pain in the stomach and bowels. It is very servicable in connection with other articles made into cough drops. [See page 672.]

DIRECTIONS FOR TREATING WHITLOWS, FELONS, &c.

When a person is afflicted with felons, whitlows, or any ulceration of the like, be particular to keep up the strength and quiet of the nervous system by soothing the stomach with stimulents and tonics. At the same time apply a poultice made of brown emetic, cayenne, yellow lily root, with yeast, slippery elm or flax seed for mucilage ; to each half pint of the poultice add two spoonsful of fine salt, and thicken with wheat bread or sponge crackers, and with a little ginger. Apply this poultice warm, and let the patient take a dose of composition and nerve powder, and then go to bed and get into a perspiration. If this does not relieve administer a course of medicine, apply to the sore the antiscorbutic poultice, and keep up the perspiration. This is almost certain to produce relief.

When the sore commences, apply to it the skin of the inside of a fresh raw egg shell, and if that does not scatter it slack a piece of lime upon the part affected. This will kill the skin and promote suppuration.

Smartweed bruised and macerated in vinegar, if applied to felons or whitlows in season, will prevent them from coming to a head.

TO CURE WHITE SWELLINGS.

Take a green comfrey root and scrape a mass the size of an egg ; to this add the white of an egg well beaten, and a glass of fourth proof brandy; mix them till they are of the consistence of a poultice. Let a plaster of this be tightly bound on the sore, and renew it as often as it becomes dry.

This plaster may be preserved in a tight jar, or be made with dry comfrey, pulverized instead of g een.

This is to be applied also in case of leakage of a joint, weak back, or weeping sinew.

HOW TO TREAT CANKER OR MORTIFYING SORES.

While the patient is under the operation of a course of medicine, let the sore be washed with soap suds; then with canker tea. While the sore is wet, add to it a powder of fine bayberry, emetic, cayenne, and slippery elm, wet and mixed together; then over this apply a poultice of ginger and canker tea. This will have a decidedly beneficial effect, and a few repetitions of it will generally effect a cure.

BILES.

A person afflicted with biles may find a cure by drinking burdock tea, and at the same time applying spirits of turpentine to the affected part. With this treatment they will soon become dry and disappear.

TO REMOVE INFLAMMATION AND HEAL OLD OR RECENT SORES.

Wash the affected parts with soap suds, then apply several thicknesses of linen cloth wet with tincture of lobelia. Keep the cloths constantly wet with the tincture, and the sore will heal rapidly and maturate but little.

A VALUABLE POULTICE

For Bruises, Burns, Freezes, &c.

In a moment after the accident, cut from the centre of a loaf of wheat bread a slice, and dip it into brewer's or baker's yeast, and let it remain till well saturated, then put it upon the part affected. This is much the best and handiest remedy which we have ever found in the above complaints.

If the yeast cannot be had, make use of the common dried emptyings, called turnpike, (which almost every house-wife has on hand) break them up fine and form into a poultice. If that is not to be had, make use of the kind of rising used in the family, to raise bread or biscuit. If that is not on hand, and cannot be had, dip a slice of the bread into pure soft water and apply that to the sore; always remembering to keep the poultice wet. Either of these remedies will ease the pain immediately, and give rest and quiet to the patient. This remedy should be kept in mind by every family, in case of accidents. It is simple but effectual, and will save much distress if applied in season.

Diarrhœa and Dysentery.

FOR RELAX OR DYSENTERY.

Take one handful each of red raspberry and witch-hazel leaves, with four ounces of pulverized flax-seed. Steep them for one hour in two quarts of water, then strain off and sweeten with loaf sugar. Add while hot two ounces of bayberry, one ounce of allspice, and a fourth of an ounce of cayenne all made fine; and to this add one quart of Holland gin. Dose, half a wine-glass three times a day, the patient being in bed if possible. This will quiet the nervous irritability of the bowels.

FOR DYSENTERY—*A good remedy for Children.*

Take four ounces of pulverized flax-seed, steep for twenty minutes in one quart of boiling water, strain off and add one pint of Holland gin, one pound of loaf sugar, and grate in, while hot, three nutmegs.

Dose, from half to a glass three times a day. If the bowels are in a cold state, while using this article, give occasionally an injection of some nourishing soup, well seasoned.

DIARRHŒA—*A capital remedy.*

I have seen the happiest results from the use of the best of Holland gin and loaf sugar, or gin and molasses, if sugar cannot be had. Take half a pint of the best Holland gin, and half a pound of fine loaf sugar. Let the sugar dissolve in the gin. Shake it well together and take a wine-glass, or for a child half a glass. Let a grown person take a glass and go to bed and put a warm brick to the feet; the anti-spasmodic properties of the gin will quiet the nervous irritability of the bowels, and ease the pain. If the bowels be in a bad state, or much clogged, a dose of castor oil may be taken in boiled milk. This will remove the morbid matter, and the gin will quiet the pain of the bowels to a charm. The patient can take a refreshing sleep, after which take a bowl of chicken, veal, beef, or oyster soup well seasoned with pepper and salt. After the bowels have become quiet, a tea made of raspberry or witch-hazel leaves may be taken with a little sugar, milk and cayenne. But if this does not effect the cure, which it will do in three out of four cases, it shows that a course of medicine is required to assist it.

RELAX OR DYSENTERY.

FROST GRAPES—*Vitis Cordifolia.*

Make a strong tea of frost grapes, and let it be sweetened and taken by the person afflicted. The taste is very astringent, rough and acid, and will operate in a very salutary manner upon the bowels, in the first stages of the relax.

If the grapes cannot be had, the tendrils that act as fingers in grasping and retaining hold on other substances, and by that means sustain the vines may be used as follows. Take a handful of those tendrils and bruise them fine, then pour on one pint of hot water; let it steep for fifteen or twenty minutes, and set it away to cool. This tea is an astringent, and may be used for constant drink. Or the tendrils may be bruised and boiled in milk, in which state it will afford nourishment with its medical virtues. The grapes and tendrils may be made into a syrup with flax-seed, bayberry and popple bark, sweetened with loaf sugar and with the addition of Holland gin, to preserve it from souring. Take a glass three or four times a day.

FOR RELAX.

Pulverize one tea-spoonful of burnt alum, and mix it well with a table spoonful of fine loaf sugar. Let this be taken from half to a tea-spoonful once an hour, and the disease soon abates.

FOR RELAX OR DYSENTERY.

Take the grains from the bottom of a jug, where a gallon of rheumatic drops, or No. 6 has been made. Put these grains into a kettle and add one quart of sweet wine, put it over the fire and let it boil for twenty minutes, when it will be seen that the acid has dissolved the gum, and the wine has become strongly impregnated with it. Strain it off and let it stand until cold; then add one quart more of sweet wine, sweeten it well with loaf sugar, then add two ounces of composition powders and one quart of good Holland gin. Put into a jug, shake it well together and stop it down for use. This remedy is good for chronic debility of the bowels, or relax, or looseness of long standing in consequence of indigestion. It is also good for weakness of the stomach, occasioned by

long debility, and may be taken by all classes for such complaints. For a grown person take from half to a glass two or three times a day, or whenever a weakness is felt at the stomach. For children give a tablespoonful just before eating, as it will then sharpen the appetite. It is good for what is called worm complaints in children, and is a great antiseptic to prevent mortification in the bowels.

A GOOD REMEDY FOR DYSENTERY,

AND A GREAT ANTISEPTIC.

Take one teaspoonful of pulverized maple charcoal, and mix with it one tablespoonful of molasses, three of West India rum, and half a glass of sweet oil. Let half of this be taken as a dose for an adult, to be repeated, if necessary, in two hours. For children the dose may be graduated according to their age.

For Pulmonary Complaints.

FOR A COUGH.

Take of 4th proof Jamaica rum one pint, good sugar house molasses one pint, add them together and let them be well shaken. This article is an excellent thing to keep a cough loose, and is a great tonic for the stomach, as the writer of this well knows from experience. He took a phial of this compound and kept it in his pocket, and when an irritation was felt upon the lungs, or in the throat, which indicated an inclination to cough, a small sip from the phial would at once allay it until such times as he had time and convenience to attend to it, once or twice in twenty-four hours, and then in a warm room. Taking care of the pence is what makes people rich. So it is in this case by attending to these slight symptoms of irritation in the throat and lungs is what produces health. This is what causes the consumption. The feet should in such cases be kept warm without fail, with cork or hat soles in the bottom of the shoes or boots, and a piece of ginger should be constantly kept in the mouth to keep the saliva thin, and the mucus membrane of the throat and lungs warm.

A VALUABLE MIXTURE FOR COUGH.

Take of hoarhound and red cedar bark of each one handful, boil it in two quarts of water down to one pint; then add one pint of molasses, and half a pint of West India rum. Put it into a bottle and shake it well together, and stop it tight for use.

Take one tablespoonful three times a day. This is a powerful pectoral mixture, and has affected some astonishing cures of lung complaints and hoarseness. It is well calculated to keep the cough loose, that the patient may raise easy. If any stimulating medicine should be wanted to assist in expectoration after it has been tried, add to every half pint of this medicine, one-fourth of an ounce of pulverized wake robin, or wild turnip. Tincture of lobelia may be added; also cayenne, if a greater stimulating quality is wanted to assist in expectoration in the morning, or after being exposed to the cold at any other time. This remedy is well adapted for hoarse, dry coughs, which hard laboring people are subject to at times, from too great exposure in prosecuting their business.

COUGH DROPS.

No. 1.

Take 6 ounces of wake robin well pulverized, when dry ; stir the fine powder into one pint of cold water, rub it until the knobs are broken, and it becomes a paste much like starch. Then pour into the same compound half a gallon of water, boiling hot ; add one teaspoonful of fine capsicum, half a gallon of molasses, and half a gallon of 4th proof Jamaica rum ; then add half a pint of tincture of the green herb of the lobelia inflata; put it into a jug or glass bottle; shake it well together and stop it tight for use. This is an excellent expectorant mixture for coughs, colds and consumptions. For those who are troubled with a cough a small phial of this medicine should be kept in the pocket and taken from one-fourth to half a teaspoonfull at a time and often, just sufficient to keep the glands of the mouth, throat, and mucus membrane sufficiently stimulated to raise easy whatever matter may have accumulated.

No. 2.

Take two ounces of lettuce seed, bruise it in a mortar, put it into one quart of hot water; let it boil for ten or fifteen minutes, then strain it off; add one pint of strong tincture of balm of Gilead, one pint of good molasses, and two ounces of wake robin well pulverized, four ounces of liquorice stick well pulverized, one gill of tincture of emetic, one ounce cayenne, and scent it with pennyroyal, or any other essence you may fancy; put it into a jug, shake it well, and stop it tight for use.

Take a phial that will hold two ounces and keep it full in the pocket for use, or at the bed side, to be used when an irritable sensation or an inclination to cough is felt in the throat or upon the lungs. Take a small sip from the phial, say from a quarter to a half of a teaspoonful; this will allay the irritation of the mucus membrane, and will loosen the phlegm so that it may be ejected from the lungs with little effort. Long and continued spells of coughing wear out the lungs. This is what should be guarded against by every consumptive person.

No. 3.

Take four ounces of flax seed well pulverized, two ounces of liquorice root made also fine ; pour upon the ingredient one quart of boiling water, and place it over a quick fire ; let it boil for twenty minutes; strain off; press the grains; then add half a pound of good honey, and half a pint of pure lemon syrup; simmer it over a slow fire for ten minutes; skim it; set away and let it cool. Then add 1-16 oz. good cayenne, one gill of good tincture of lobelia, and half a pint of 4th proof Jamaica rum. Put it into a glass bottle and shake it well together Fit for use.

APPLICATION.

The best way to use this medicine is to have a phial of about 2 ounces of it in the pocket. When any irritation is felt upon the lungs or in the mucus membrane, take a small sip from the vial, say one teaspoonful, and so continue to repeat it as often as the irritation is felt, if it be fifty times a day. These drops are very valuable in recent attacks of cold with old or young. They are also good for asthma, croup, or any difficulty of the chest or lungs.

N. B. A tablespoonful may be taken on going to bed, and it may also be taken during the night if necessary. Let a tablespoonful be used in the morning on leaving the bed. It should be also taken before exposure to cold, and after such exposure to keep the temperature of the lungs even.

No 4.

Take four ounces of liquorice ball and eight of gum Arabic, dissolve them in two quarts of soft water over a slow fire, then add half a gallon of boiling water, with two ounces of dyspepsia powders, half a gallon of molasses and the same quantity of wine bitters, which have been mixed. Then cut up six lemons and macerate them well in half a gallon of alcohol, to extract the oil from the skins, and form a strong essence; add it to the other ingredients ; then put in one quart of tincture of lobelia and two teaspoonsful of cayenne; shake it well together and it is fit for use.

A VALUABLE SYRUP FOR COUGHS.

Take one pound of hoarhound, broken up fine, steep it in two quarts of water for twelve hours, strain off and boil the liquor down to a pint; take two ounces of skunk cabbage and one of wild turnip, pulverize and boil for two hours in two quarts of water, and when cool strain off and mix it with the decoction of hoarhound. Then add two quarts of fourth proof spirits, and one pound each of boiled honey and loaf sugar. Let this compound be put into a jug and boiled, with the cork left out, in a kettle of water for half an hour, when it will be fit for use.

This will enable a person afflicted with a cough to raise easy, without injuring the membrane of the lungs or throat.

Dose for an adult, a tablespoonful.

Liniments.

RHEUMATIC LINIMENT.

Take three pounds of white soap, and dissolve it in two quarts of rain or soft water, by boiling; next, dissolve two ounces of camphor, one do oil of rosemary, and half an ounce of oil origanum, in one gallon of high wines; add the whole compound together in a stone jug. Then take two ounces of good cayenne pepper and put it into a point of boiling water, let it steep over a hot fire for ten minutes, then pour it into the jug, shake the contents well together, and stop it close for use.

APPLICATION.

This is good for rheumatism, pains in the side, cold feet, head-ache, sprained joints, &c.

HOW TO BATHE THE FEET IN HOT WATER.

A USEFUL METHOD TO REMOVE ALL RECENT ATTACKS OF DISEASE.

Take a dose of the prepared composition, then put the feet into a pail half full of water, as hot as the patient can bear it, having the body well shielded with a cloak or blanket while bathing. Increase the temperature, by adding more hot water, by pouring it in on one side of the pail, while the feet are still in the vessel, and having one hand in the water in active motion, mingling the different temperatures as fast as possible. In

ten or fifteen minutes the patient will be in a profuse perspiration, every part of the body being full of heat, and an active circulation.

Continue this operation until the perspiration stands upon the temples, on the upper lip, and the palms of the hands, and the veins are full upon the feet and the back of the hands. These are symptoms that the body is sufficiently warm. Then take out one foot and wipe it dry with a towel or napkin, and bathe the foot thoroughly with the stimulating liniment; then put on the stocking. Treat the other foot in the same manner.

In all cases, this is the most rapid course I ever adopted to fill the system universally with warmth, and to produce an active perspiration. In all violent attacks of disease, such as colic, pleurisy, inflammatory rheumatism, cramps, lock-jaw, croup, quinsy, &c., where the patient requires immediate relief from a dangerous disease, this is preferable to steaming. But steaming is the best course that can be adopted to clear the skin or cutaneous system universally of the morbid matter it contains.

Where the patient is subject to cold feet and pains in the head, he can make a great improvement to his steam bath, by putting his feet into a pail half full of water as hot as he can bear. All excessive circulation to the head will be speedily removed by this operation, provided the bowels are in good order, and the whole body and limbs below the neck are bathed with the stimulating liniment.

STIMULATING LINIMENT—AND BATHING THE FEET.

Melt one pound of white soap and add it to a gallon of high proof whiskey; after which, take two ounces of cayenne pepper and boil it in half a pint of water for five or ten minutes, then add it to the whiskey, together with a little essence of hemlock, and it is fit for use. Shake it well together and pour it off into phials.

It is good to bathe on to the feet when cold, also over the body after steaming.

APPLICATION.

It is an excellent article in a great variety of complaints, such as cold feet and hands, palsy, numbness, tooth-ache, cramps, pain in the head, back and side, and rheumatism.

When a person is troubled with head-ache, or any uneasiness about the head or stomach, by bathing the feet thoroughly by the fire before going to bed, and sit with the legs across a second chair, with the bottom of the feet as near a hot fire or stove as can be borne, with a screen before the face and head to shield it, much relief will be obtained; for the head will be relieved at once if the bowels are right.

VOLATILE LINIMENT.

Take of sweet oil six ounces, spirits of hartshorn one ounce, oil of origanum one fourth of an ounce, shake them well together in a bottle, and stop it tight for use.

APPLICATION.

Good for sprains, bruises, swellings, and local pains.

VOLATILE LINIMENT,

For Violent Sprains, Rheumatic Pains, &c.

Take four ounces of sweet oil, and one ounce of spirits of hartshorn—shake them together in a phial for use.

APPLICATION.

To be used for sprained joints, or violent attacks of pain of any kind.

OCMPOUND LINIMENT OF SOAP.

Take of camphor one ounce, soap three ounces, spirits of rosemary one pint, half an ounce of cayenne; digest the soap and cayenne in the spirits of rosemary until the soap is dissolved, and add to it the camphor.

APPLICATION.

This is useful to excite action on the surface, is used to disperse scrofulous enlargements, and is good to moisten flannel to apply to the throat in cases of quinsy, pleurisy, croup, &c.

LINIMENT OF LIME WATER.

Take of lime water three ounces, after it has stood long enough to become perfectly pure, and of olive or linseed oil three ounces; mix by shaking or stirring it well together, and it forms a kind of soap of a whitish color and devoid of acrimony.

APPLICATION.

This article is excellent for burns, scalds, chapped hands and chafes. It is best to make it fresh when it may be wanted.

RHEUMATIC LINIMENT.

Take half a pint of the small inflated buds or capsules growing upon the sea kelp, or sea weed, a plenty of which is to be found on the sea shore of the northern states; put these buds into half a pint of fourth proof brandy and heat it over the fire, and by continual stirring it will become a thick jelly.

This is for bathing the stiff backs, joints, &c., of those who have the rheumatism, and is said to be an excellent remedy.

FOR THE CHRONIC RHEUMATISM.

Take half a pound of black cohosh and bruise it well in a mortar, pour upon it one pint of boiling water, let it steep for ten minutes, then put it into a jug, and add one quart of good Holland gin. Let it stand twelve hours, to impart the strength of the roots to the liquor, and shake it often together.

Take a glass three times a day, or oftener if thought advisable, and it will very soon relieve the pain.

This remedy should not be taken by pregnant women, as it will produce abortion, and consequently weaken the constitution.

Note.—Take one tablespoonful of black cohosh, finely pulverized, put it into a tea cup, and fill the cup half full of boiling water; let this be taken three times a day, and it will generally relieve in three or four days.

VOLATILE TINCTURE.

To one quart of cherry spirits, add two ounces of cayenne, and when settled pour off, and add a few drops of the oil of pennyroyal.

VOLATILE SALTS, OR HARTS-HORN.

Take of crude sal almoniac one ounce, of pearlash two ounces; pound each by itself, mix them well together, and keep it close stopped in bottles for use.

By moistening it with essence, the strength will be increased. Applied to the nose, this is good for faintness, and to remove pain in the head.

Ointments and Salves.

WAX OINTMENT.

Take of white wax four ounces, spermaceti three ounces, olive oil one pint; mix them together over a slow fire, and stir them very briskly without ceasing until they are cold.

APPLICATION.

This ointment, when rubbed over the face and hands but lightly, produces a soft smooth surface, very agreeable to the touch, similar to the softest silk. It also removes all chaps and roughness of the skin.

It makes a good lip salve, and is also good for sore nipples, for which use it should be kept by those who may want such a remedy.

SIMPLE OINTMENTS.

Take of olive oil five ounces, white wax two ounces. Melt the wax in the oil over a slow fire, and set it away to cool and continue to stir the compound until cold.

APPLICATION.

This ointment is useful for chapped hands and face, and is an excellent article for *softening the skin.*

OINTMENT OF LARD.

Take of hog's lard two pounds, rose water four ounces. Beat the lard with the rose water till they are mixed; then add four ounces of white wax, and melt the mixture over a slow fire, and set it apart, that the water may subside, after which pour off the ointment from the water, constantly stirring it until it be cold.

APPLICATION.

Good for softening the skin, sore nipples, and chapped hands and face, and is good for chafes in the groins, or any other part of the body, for both young and old.

BURN OINTMENT.

Take of beeswax and Burgundy pitch and melt them together; then mix sweet oil until the compound has the consistency of ointment.

APPLICATION.

This salve will ease the pain of a burn almost immediately on its application, for which purpose it is very valuable. It is also good for fresh cuts, or wounds and bruises of the flesh.

OINTMENT FOR THE PILES.

Take yarrow blows, and simmer them in fresh butter, and annoint the parts affected. [See pages 647 and 652.]

OINTMENT FOR PILES, POULTICE AND WASH FOR VENEREAL.

Simmer together two ounces of the toad lily root (*Hemerocallis flava*) two ounces of green emetic (*lobelia inflata*), and a piece of white vitriol (*sulphate of zinc*), about the size of a walnut, finely pulverized, in half a pound of fresh butter; strain off, and you have an excellent remedy for syphilitic sores.

A wash may be made of the same articles that will destroy the irritation at once. It may be injected in form of decoction into the penis in bad cases with great advantage.

The lily root, compounded with slippery elm and sponge crackers to form a poultice, may be applied to old ulcerous sores, or over the head of the penis, from which it will soon extract the morbid poison, if followed up daily. An injection per *ani* may be usefully employed once or twice a day while the poultices are used.

This remedy should be remembered by practitioners who may attend such cases.

OINTMENT FOR RELAXING MUSCLES.

Take one pint of angle worms and simmer them two hours in fresh butter over a slow fire, then strain off and add two ounces of oil of origanum, one ounce of spirits of camphor, and a fourth of an ounce of fine dust of cayenne pepper. Stop it close in bottles for use. If the fresh butter cannot be had, any kind of soft animal or fish oil may be substituted.

This ointment may be used to great advantage for stiff joints, contracted muscles, cramps, or lock jaw, or in any disease where the muscles of the body are violently contracted. It should be rubbed thoroughly into the part and dried by the fire, or by holding as near it as can be borne some heated substance, and continue rubbing it till it is dry.

Let this course be adopted in the morning, and at night on going to bed. Always take warming medicines before this application, and if necessary a course of medicine.

OINTMENT FOR SPRAINS, SWELLINGS AND RHEUMATISM.

Simmer together for fifteen minutes, half a pound of neatsfoot oil, one gill of fourth proof brandy, one gill of spirits of turpentine, and half an ounce of cayenne. To be applied hot to the part affected, after which wrap it in flannel bandages.

Let composition or hot drops be taken, to keep the patient from feeling faint or weak at the stomach.

FOR SALT-RHEUM, OR SCALD HEAD.

Take of fresh hog's lard and of tar equal quantities, say one pint of each; put them into one pail full of soft rain water, boil the same for two hours; keep the kettle full of water, when done boiling set it away and let it cool.

APPLICATION.

Spread plasters and apply to the sores. The happiest results have attended the use of this ointment, in eruptive sores, such as above mentioned.

FOR SALT-RHEUM OR CUTANEOUS DISEASES.

Take of the Seneca or sweet clover one handful, and lovage one handful, bruise them together and simmer them in fresh butter or hog's lard

for three hours, or until the moisture is dried away, or the oil has absorbed the virtues of the herbs; strain off, and press the grains.

This is an exellent softening and fragrant ointment for any eruption of the skin, such as salt-rheum, chaps, or cracked hands, or for scorbutic diseases generally.

SALT-RHEUM WASH.

Take one ounce of the cow, toad, or yellow lily root, bruise it fine, put it into half a pint of boiling water, let it steep for ten minutes; strain off half a teacup full of the tea, add three tablespoonsful of milk; it is then fit for use.

Next, wash the part diseased with soap suds; dry off the sores—then wash thoroughly with this tea, which will remove the peculiar itching or irritation, and will purify the sore by its roughness. Next put over the sore three thicknesses of linen or cotton cloth, wet with the tea; continue the use of the tea, and keep the cloth and sore or sores thoroughly wet day and night until they are healed.

The sores should be cleansed twice every twenty-four hours, or oftener.

The yellow or cow lily is a great counter-poison to all irritating ulcers, or sores of any kind upon the surface; and is one of the best remedies when made into a poultice for biles, whitlows or felons, and to cleanse old sores in use.

ADHESIVE, OR STICKING PLASTER.

Take of common or litharge plaster, five ounces, and one ounce of white rosin; melt them together, and spread the liquid compound thin on strips of linen with a table knife.

APPLICATION.

This plaster is good to keep the lips of wounds together, that they may heal, and is also used to keep on dressings.

STRENGTHENING PLASTER.

Melt two ounces of rosin and add to it a teaspoonful of cayenne to make it stimulating, and lard sufficient to make it of the right consistency, which may be known by dipping a knife or spoon into it, and then putting it into cold water. If you get it too soft, add more rosin.

This is an excellent plaster for rheumatic pains in the back, side, or limbs. Decayed teeth that are troublesome may be filled with it, and the pain relieved immediately. This plaster applied to the face or breast is excellent for the cold or ague affecting those parts, and if applied to the face, is a good remedy for *tic doloreaux*. All those troubled with any difficulty in which we have recommended this plaster, should not fail to make use of it, as we can assure them it is an excellent application in all such cases.

Plasters should be raised about once in two days, to clear the morbid perspiration from the surface underneath, and give ease to the parts.

BLACK SALVE, FOR OLD ULCEROUS SORES.

Take half a pint each of linseed and olive oil, and half a pound of red lead, and simmer them down to a salve. If burnt it is spoiled.

This is one of the most efficient plasters we have ever applied to old putrid ulcers that have resisted the effects of every other remedy.

HEALING SALVE.

Take one pound each of beeswax and salt butter, half a pound of turpentine, and twelve ounces of balsam fir; simmer them together, strain off, and it is fit for use.

It is good to heal fresh wounds, burns, scalds, and all bad sores.

STRENGTHENING PLASTER.

Take equal quantities of burdock and mullein leaves, bruise and put them into a kettle with a sufficient quantity of water, boil them well; then strain and press out the liquor and boil it down about half as thick as molasses; then add three parts of rosin and one of turpentine, and simmer till the water is all evaporated. Put it into cold water, and work it with the hands. If too hard, add more turpentine—if too soft, more rosin.

This is good for weakness in the back, or any part of the body.

For Catarrh.

Pulverized pipsissewa may be used alone, as snuff, or compounded with equal parts of bayberry bark, blood root, and witch hazel leaves, finely powdered. Thus compounded, it is good for polypus in the nose.

Sore Eyes.

EYE WATER.

Take of unicorn, goldenseal, and bethroot, of equal quantities, or $\frac{1}{4}$ of an ounce each, well pulverized; put this compound into a phial containing four ounces of hot drops; shake it well together for several days in order that the drops shall extract the virtue of the roots.

APPLICATION.

Put three drops of this compound tincture into a mixture of milk and water of equal quantities, and dip a linen rag into the mixture and then close the eyes and wash the lashes thoroughly, by which means the medicine will work itself into the eyes and produce a salutary effect. If the internal surface of the eyelash is sore, let one drop or more fall into the eye. Then wet two or three thicknesses of linen with the mixture, and put it upon the eyes on going to bed, and put a few extra folds wet with cold water over the other to keep it moist and to reduce the inflammation; put a folded handkerchief about the head to keep these cloths to the eyes, and unless the difficulty originate from the body this remedy will generally effect a cure.

This is also a good application for sore breasts.

FOR SORE EYES.

When the eyes are weak or inflamed break and pour out an egg fresh from the shell, and the last drops of the white may be dropped into the eyes. In two or three days they will become strong and the inflammation will be removed. This remedy is excellent for weak eyes either for young or old. [See page 647.]

CURE FOR FILM IN THE EYE OF A HORSE OR OX.

Edward S. Jarvis, Esq. of Surry, Me. in a letter to Mr. Joseph R. Newell, proprietor to the Boston Agricultural Warehouse, states as follows:

Have you ever heard of a cure for a film on the eye of an ox or a horse? I was told of one eighteen or twenty years ago, and have been in the practice of it ever since with perfect success. It was brought to my mind by just having had proof of its successful application in a calf that had its eye hurt by a blow from another creature. A film formed over it and it was thought its eye was lost. But by turning into the opposite ear, a great spoonful of melted hog's fat, it was cured in 24 hours. I do not pretend to account for this, but I have seen it tried with success so often, that I think it ought to be made public, if it has not been before. I learned it from an Indian.

N. B. The above remedy we give as we find it, and if it be correct that a film can be removed by such means from the eye of a dumb beast we can see no reason why the human species may not be benefitted by the same means. It is certainly worthy of consideration. J. T.

STEAMING

A great improvement for persons who have a low circulation, and a heavy pressure of blood to the head, cold feet, and a bad digestion.

When the feet are cold and the head distressed, or the veins low in the feet and full upon the temples, let the person when he goes into the bath, put his feet into a pail half full of water, as hot as he can bear it. Let the temperature of this water be raised or increased by the addition of more hot water, as fast as the patient can bear it, at the same time keeping up a lively steam upon the body. This is decidedly the best course that heat can be applied to produce a uniform circulation through the system. When the bath has been applied a sufficient length of time, take a quart of cold water and add sufficient hot water to render it but one or two degress colder than the air. Pour this over the top of the head and all over the body and limbs. Wipe off with a cloth, and bathe the *feet, legs and body* thoroughly with liniment.

This operation will give new life and vigor to the body, and the head will be much improved if the bowels are in good order at the time.

COUNTER POISONS.

To cure the bites of snakes of various kinds, the bites of spiders, stings of bees, and other poisonous insects.

Let the following directions be attended to, as soon after the accident as possible:

Take as wide a mouth bottle as possible, that will hold from one gill to half a pint, or if that is not to be had, a gill cup or wine glass, that is perfectly tight except at the top; put into it from half to a glass of the strong spirits of camphor. Then put the mouth of the bottle, or the top of the cup upon the wound or bite, and invert it bottom side up, and keep the mouth of the bottle so tight against the flesh that the spirits will rest upon the wound, and not leak out or waste away. By watching the spirits closely you will perceive a movement of the camphor between the flesh and upper surface of the liquid, as if the rarification of the air in the bottle and the counter poisonous qualities of the camphor, was not only neutralizing the virus in the body but drawing it out of the flesh into the

bottle. And the effect is almost instantaneous upon the patient. Where there was pain before, now ease, quietude and peace predominate.

BY JUDGE UNDERWOOD.

Rufus Black, of Cherokee county; Alabama, about sixteen years of age was very badly bitten on the top of his foot by a large rattlesnake, which instantly appeared to be progressing to death. His father being informed that Mrs. Pattan kept the tincture of lobelia, lost no time in applying that powerful remedial agent, by giving the youth a wineglass full every fifteen minutes, until he took five, which vomited him copiously, and so completely cured him that he walked about that same evening, and enjoyed company, and was quite well the next day, except the bitten spot itself, which was so badly bitten that a large plug sloughed out, and he is perfectly free from it ever since.—*Southern Botanico-Medical Journal.*

TO EXTRACT POISON BY SUCTION.

We are informed from good authority that in three separate cases where people had been bitten by poisonous serpents, once by a copper head and twice by rattle snakes, that the poison was readily extracted by a person applying the mouth immediately after the accident to the wound, and drawing out the poison by suction.

Remedies worthy the attention of Females.

MOTHER'S RELIEF.

Take two pounds of partridge berry vines, half a pound each of high cranberry or cramp bark and unicorn root, a fourth of a pound of blue cohosh or pappoose root, and one pound each of flax seed and red raspberry leaves ; let as many of these articles as possible be green and all well pulverized; boil them in three gallons of water for two hours, then strain off and continue to simmer till it is reduced to a gallon and a half; then add four pounds of loaf sugar and half a gallon of good Holland gin.

Let half a glass of this compound be taken three or four times a day, for several weeks before confinement. This will strengthen and invigorate the constitution before childbirth so that the mother will pass the time of labor with little danger, and will be less liable to take cold after confinement. This article should be used by every prospective mother.

TO CURE THE WHITES OR FLUOR ALBUS.

Put one handful of dog, or box wood blows, (*Cornus Florida,*) into a bowl; pour on sufficient quantity of boiling water to wet them thoroughly then add half a pint of good Holland gin. Stop it tight in a bottle for use. Take from half to a glass three times a day ; increase or diminish the quantity as circumstances may warrant.

This remedy has cured some obstinate cases of the *Fluor Albus* in this city, where the severity of the complaint had resisted the power of every other remedy. In several cases where females had been sorely afflicted for several years after being married, and never had any children, by the use of this remedy alone they have been restored to health, and all the other difficulties obviated. I have one case in my minds eye who had been weakly for several years, and without a child,

and about ten years since she took this remedy, and I believe she has been rewarded liberally by the addition of six new members to her family since. Thus you see, ladies, you can choose or refuse the good things of this life.

FOR FALLING OF THE WOMB, OR PROLAPSUS UTERI.

Burn and pulverize white beans, and make a beverage of it the same as coffee. Let the patient use this as a constant drink for a week or two, or till the cure is effected. This is said to be a certain remedy.

A USEFUL SYRUP FOR WEAKLY FEMALES.

Take one handful of Spikenard roots,
do. do, Comfrey, do.
do. do. Sarsaparilla, do.
do. do. Smooth leaf plantain, do.
do. do. Black alder bark,

bruise the roots and put them into one gallon of water and boil them for one hour ; strain off and add two pounds of loaf sugar, four ounces of ginger and one of rheubarb, and when cool one quart of brandy; stop it close in a jug for use. Take a wineglass about three times a day before eating.

FOR BREEDING OR NURSING SORE MOUTH,

OR FOR SORE MOUTH OF ANY KIND.

Take of sage one ounce and boil it in half a pint of water to one gill; strain off and add one gill of good honey, after it has been boiled and skimmed. Then add half an ounce of borax well pulverized. Let the borax be dissolved and well stirred or mixed in the compound, when it is fit for use. Keep it in a bottle stopped tight.

This isgood for mothers who have what is called the nursing sore mouth, or for women who are in the family way when the mouth is sore. It is rough and will collect the thick phlegm or mucus from the glands, or the fauces or throat ; and will cleanse the sores and purify the breath. It toughens the mouth and removes all soreness.

Take a teaspoonful and gargle the mouth and throat five or six times a day.

POWDER FOR SORE MOUTH.

Take marshrosemary, bayberry, chalk, rosin and sumach berries of each equal quantities, finely pulverised. To this add as much white sugar as all the rest; let them be well mixed. To be taken into the mouth dry, or for children it may be wet or made into tea.

APPLICATION.

These powders may be used dry in the mouth, or in a moist state for children. Repeat the application until a cure is performed. If too drying, double the quantity of sugar. If it still continues too drying, double the quantity of sumach berries.

FOR SORE NIPPLES.—*A useful Plaster.*

Take a linen cloth, and gather the corners and sew them in such a form as for it to resemble one half of a ball-cover, or so that it will fit the breast over the nipple. Then melt wax and rub it over the inside of the case; apply several thicknesses of the wax, until the case becomes well

saturated. This when applied will cause a free perspiration of the breast, and will remove agues and hard bunches, and heal all sores of the nipples by constant use.

ANOTHER REMEDY.

Take a ball of beeswax and warm it so that it becomes pliable, then work out a plaster in form and shape so that it may fit snugly upon the breast, about three inches from the nipple each way; let this be used constantly upon the breast before and after nursing, and a moist perspiration will immediately start under it, and there will be no sore nipple, nor inflamed, caked, or broken breasts. The bosom of the dress should be so snug as to keep the plaster so close to the breast as for it to adhere as tight as possible. This should be remembered by nursing mothers.

TO PREVENT SORE NIPPLES OR BREASTS.

Bathe the breasts daily before confinement with beef brine. We know this to be a valuable preventive, and those who would regard their comfort after confinement should not neglect this precaution.

FOR SORE NIPPLES.

Take a handful of the herb pellitory of Spain, (*Parietaria officinalis*) and simmer it in butter until the entire strength is exhausted from the herb; strain off, and the ointment is fit for use.

FOR INDIGESTION AND FEMALE OBSTRUCTIONS.

BROOK LIME—*Veronica Beccabunga.*

This article is said to be a valuable remedy for indigestion and consumption. It is stimulating and is good in form of bitters to regulate the monthly turns with females, by removing obstructions.

FOR NERVOUS IRRITABILITY OF WEAKLY PATIENTS.

MOTHERWORT—*Leonurus Cardiaca.*

Take of Motherwort a handful, and make a strong tea, and let it be drank hot by the patient on going to bed, or when the spasms come on; this will produce almost immediate relief with either male or female.

Feaverfew, Mugwort, or double or single Tansey, will produce nearly the same effect.

Miscellaneous.

FOR CHAPPED HANDS AND FEET.

To cure cracked hands, when injured by lye in washing, and they are very painful—or chapped feet in the spring and fall, common to children:

Wash the hands or feet clean, dry them well by the fire, then rub them well over with vinegar. When the surface is dry, wash the acid off again with clean warm water, and when dry annoint the parts with cream; but if that cannot be had, milk may be substituted. Rub two or three

coats over the parts affected, and dry it in by the fire; the pain will be relieved at once, and the sores will immediately heal up.

Those who are in the habitual use of lye, potash, or any other corrosive substance, will do well to remember this remedy.

TO PREVENT TOOTH-ACHE.

Bathe the top part of the head and back of the neck in cold water at every time you wash. Those who do this, will generally avoid not only the tooth-ache, but also the head-ache.

TO RELIEVE THE TOOTH-ACHE.

If the tooth be hollow, roll up a piece of cotton the size of the orifice, and wet it with summer savory oil, hot drops, spearmint or peppermint oil, or the tincture of pepper, and press it snugly into the tooth; or plug it with the stimulating strengthening plaster, after having cleansed and dried the cavity with cotton. This will generally relieve. [See page 734.]

If the tooth is not hollow, but is affected with the ague and distress in the jaws, make a small bag of cayenne, of the size of a white bean, and place is between the teeth and cheek. Take some warming medicines, such as composition or cayenne tea, or hot drops; this will warm the stomach and much assist in affording relief.

FOR THE TEETH.

Honey, mixed with pure pulverized charcoal, is said to be excellent to cleanse the teeth and make them white. Lime water, with a little Peruvian bark, is very good to be occasionally used by those who have defective teeth, or an offensive breath.

SNUFF FOR POLYPUS IN THE NOSE.

Take pulverized blood root and saturate it with the sap of the black ash tree, tried out by laying a green stick near a hot fire. Make a thick paste of these articles, then dry and pulverize it.

This snuff may be taken several times a day. A small quantity of bayberry may be added to the blood root, which will be some improvement. The sap of black ash may also be used to advantage alone, or with hot drops, by snuffiing it.

When a polypus has been extracted from the nose, a free use of this snuff will usually prevent it from growing again.

HOW TO MAKE ESSENCE.

To make any kind of essence:—Add a teaspoonful of oil to a pint of fourth proof spirits, and shake them well together.

TO REMOVE A TIGHT RING FROM THE FINGER.

Thread a needle, flat in the eye, with a strong thread; pass the needle with care under the ring and pull the thread through a few inches towards the hand; wrap the long end tightly round the finger, regularly, down to the nails, to reduce its size. Then lay hold of the short end of the thread to unwind it. The thread pressing against the ring will gradually remove it from the finger. This unfailing method will remove the tightest ring without difficulty, however swollen the finger may be.

Flowers deleterious in sleeping apartments. [See page 69.]

TO EXPEL INSECTS FROM THE EAR.

Insects frequently gain access to the ear, and create excrutiating distress; to remove which, pour in a few drops of alcohol, brandy, or spirits of camphor, and they immediately come upon the surface.

It is not unfrequently the case, that both children and grown persons are troubled with distress in the head from this cause, when they suppose it to be the ear-ache.

RECEIPT FOR TETTER.

Take half a pound each of narrow plantain, lobelia inflata, narrow dock roots and blood root, and steep them in half a gallon of good vinegar at blood heat for thirty hours; strain off and press the grains.

Take emetic pills or tincture daily; and about twice a week, at night, take a bath, and after rubbing the surface well then apply this wash and let it dry. It may be used several times a day.

FOR FISTULA.

Take a lump of salt about the size of an egg, the same of hard soap; then take a quantity of poke root (*Phitalachia decandria*) and boil it separately until it becomes a syrup of about one pint; then mix the salt and soap with it, to the consistency of hard soap. Wash the parts affected night and morning for a week or fortnight, and the cure is effected.

TO CURE CORNS ON THE TOES. *Clavus.*

Take half a pint of *water cement* in good condition, fresh from the cask. Wet up a tablespoonful and put it in form of a poultice upon the corn just before going to bed; keep it snug during the night, and in the morning you will have a hard lump of plaster, to remove from the toe, the corn and flesh having absorbed the moisture of the poultice; it should be borne in mind that the cement should be put only upon the upper side of the toe, or the side affected, as it would be difficult to remove, if the part affected should be encircled entirely with it, without the assistance of a hammer or some heavy instrument, to break the cement, which might be attended with some pain to the individual. Continue to apply this preparation for about one week and the *clavus* part will detach itself from the live flesh, and by the application of a little oil the corn may be removed and the sore healed.

This discovery was made by one of the contractors on the Croton Waterworks accidentally. One of the laborers who was mixing the water lime or cement had many corns upon his feet, and he was about in the mortar in his bare feet, and it was but a short time before his feet were entirely clear of those troublesome appendages.

ANOTHER REMEDY FOR CORNS.

Soak the feet well in hot water until the corns become soft, then shave them down to the quick. Let two or three drops of tallow hot from a candle be applied to the corn; rub it well in; then wind a strip of linen cloth two or three thicknesses about the toe and make it fast; continue to wear this cloth until it wears out and comes off. I have known many corns cured from this remedy alone.

FOR SCARLET FEVER.

A very simple remedy for this dreadful disorder, is merely a mixture of cayenne pepper, salt and vinegar, used as a gargle, occasionally swallowing a teaspoonfull.

FOR BLEEDING AT THE NOSE.

Great relief if not a radical cure may be affected by bathing the feet in stimulating liniment, and using snuff freely, made of pulverized witch hazel leaves, to contract the blood vessels in the head.

IMPORTANT ADVICE TO YOUTH.

Keep the head cool, the feet warm, take no mineral or poisonous medicine, and bid defiance to doctors.

STEEL BUSKS.

It is extremely probable that whatever conducts the electricity of the body from it, will occasion direct debility. With this view I have long been in the habit of causing females who use steel supports in their stays to lay them altogether aside.

ASTHMA.

We learn from an intelligent friend who has long been afflicted with this most distressing complaint, that the fumes of burning paper saturated with a solution of saltpetre gives him perfect relief. He keeps a quantity of paper which he been simply soaked in strong saltpetre water and afterwards dried, constantly on hand, and on the recurrence of a paroxism obtains almost instant relief from burning half a sheet or a sheet in his room. Others who have been similarly affected have tried it, with corresponding benefit. In no case has it been known to fail, as far as his information extends.

We deem the testimony sufficient to warrant the publication of the prescription, which certainly has the merit of simplicity. If it shall prove generally efficacious, its value is beyond price. It can be readily tested.

We think the leaves or lobelia inflata would be far better, and less dangerous to the health of the patient.

Miscellaneous Observations,

UPON VARIOUS SUBJECTS CONNECTED WITH DISEASE AND ITS TREATMENT, REMARKS, &c.

FOR THE QUINSY, PUTRID SORE THROAT, CROUP,

Or any difficulty or inflammation about the throat, neck, or organs of respiration, occasioned by taking cold, or pressure of blood to the head.

In all the cases above mentioned, the difficulty is brought on from the loss of animal or vital warmth, consequently cold feet, costive or relaxed state of the bowels, attended with more or less torpidity of the stomach, and digestive apparatus; and a consequent excess or pressure of blood to the head.

TREATMENT.

Take a dose of composition, and get the body into a comfortable state as regards warmth; then bathe the feet in as hot water and continue to increase the temperature until the heat is as great as the patient can bear. Continue this operation for twenty or thirty minutes, keeping the body well shielded from the air, then take out one foot and wipe it dry with a

cloth, and then bathe it thoroughly with stimulating liniment, which dry in by the fire; put on the stocking, then take out the other foot and treat it in like manner. Let the patient go into a warm bed, with a hot stone at the feet to keep up the perspiration, which this course will produce; then make an injection of composition or No. 3, moderate in point of astringent properties, sweeten with molasses, and add one ounce of the strongest kind of third preparation. Before using this, the bowels may be cleansed by administering a gentle enema of warm milk and water. After which, use the first or strong injection, thoroughly applied, and when it operates the scene of excitement is changed from the head and neck for the bowels and lower extremities. Now administer a gentle emetic of the green herb, which will operate mildly and create but little excitement in the stomach. This course will throw the blood to the lower extremities, and relieve the pressure at the head and the difficult respiration. Now take two ounces of the strengthening plaster and melt it; add one teaspoonful of the finest and best cayenne pepper, stir it into the plaster; and should it be too stiff, add a little hogs-lard, which will soften it to a suitable consistency. Next cut a piece of leather or thick muslin, so that it will fit in upon the throat and out to the outer edges of the lower jaw and chin, and extending down the throat and neck about six inches, around just back of the ears on each side of the face; spread the plaster upon this cloth, or leather, of sufficient thickness, and put upon the neck; and if it does not set snug, slit it under the chin in several places until it will lay close to the neck and chin without wrinkles. This plaster will draw out the inflammation and relieve the patient almost immediately.

In all cases of croup, cloths wrung out of hot water may be applied to the bowels of children with good success, to assist vitality by absorption, while you use the other remedies.

In this treatment, it will be perceived that the great benefit derived, was in transferring the seat of excitement from the upper to the lower extremities until the obstructions above were removed, which requires but a short time. By this course of treatment I have cured many serious difficulties of the lungs and throat; and in fact, the treatment is excellent in any case of disease, as all require an equilibrium in the circulation, and this is one of the most effectual ways to produce so desirable a result.

In all cases nourishment should be freely used, such as milk porridge, chicken soup, water gruel, beef tea, or any other substance of which the patient is fond, as it strengthens the body and allows the medicine to produce a more thorough operation.

TO STOP THE LEAKAGE OF JOINT WATER.

In case a joint be cut so that the water exudes from the wound, the most proper treatment is to wash it thoroughly with cold water, then wipe dry and bathe the internal surface of the wound with hot drops; then close it together with a needle and thread; bind upon the sore a soft sponge, which will dry up the leakage at the same time and close the lips of the wound. In eighteen or twenty-four hours the parts will be badly swollen in consequence of the internal discharge of the joint water into the flesh, which will cause it to extend and be extremely painful; then a powerful stimulant or draft must be applied, to remove through the pores the matter that accumulates in the flesh until the sore heals at the bottom. The limb should be kept very still. If it be the knee or ankle, it should be placed upon a pillow in a chair and let the hot medicines be taken freely to keep up a perspiration, which will remove all inflammation in a

few days. A poultice of comfrey and white turpentine may also be usefully applied to the wound. In a few days the sore will be healed at the bottom, provided you remove the matter from the flesh by perspiration as fast as it accumulates from the wound internally. Let the limb be kept elevated and still, and straight if possible, on a board.

Scraped sole leather applied to such wounds will also stop the leakage of the joint, and may be used instead of the sponge, if the proper means are employed to keep up the perspiration.

RHEUMATIC PAINS, AND DEBILITY IN THE KNEES.

A gentleman called on us, who was troubled with great weakness in his knees, from rheumatic pains. His limbs were so weak that he was under the necessity of using a cane in each hand. He said that his knees felt as if the joints would part and let his body down, whenever he attempted to rise from his chair, which he could do only with the assistance of both his hands, and then with great difficulty, so weak were the joints.

TREATMENT.

I made a long bandage of cloth, the same as I would do to brace up a broken limb, and spread the whole length with stimulating plaster. Then I commenced below the knee, and passed the plaster entirely around the limb, then under the hollow of the knee and around the limb above it, applying it closely, and then brought it around again directly over the knee pan, and attached it by the adhesive properties of the plaster to the bandage on the side. Thus the limb was braced above, below, and across the joint, which served as artificial support.

The other limb was treated in the same way; the person at once arose from his chair, and without the assistance of his canes walked across the room, declaring that he had not been able to walk with so much strength and ease for a long time.

SETTING A BONE IN THE FOOT.

A lady by accident stepped into a hole and sprained or turned her foot in such a manner as to injure it, so that she was not able to walk upon it for several weeks. She employed one of the best surgeons in the place, who applied wormwood and vinegar, and a great variety of remedies, but all to no purpose. It was badly swollen, and she was obliged while sitting to keep it elevated on a chair, being unable to bear it on the floor. She wished us to relieve her if possible. We examined the foot, and it appeared to us that the metitarsal bone where it is joined to the first phalanx of the little toe was out of place, for when she put it down she said it seemed as if that part touched the floor before any other part of the foot.

TREATMENT.

We put her foot into hot water and bathed it thoroughly, at the same time giving suitable medicines at the stomach, thus starting an active circulation throughout the whole system, and relaxing the muscles and making them pliable, and then applied the stimulating liniment to the foot. We then cut out a piece of thin board about the size and just in the shape of the bottom of the foot, hollowing out a space about a quarter of an inch deep directly under where the metitarsal bone would come

upon the surface of the board. We then made a bandage about two yards in length and rolled it; then we placed the bandage across in front of the foot and carried the roll back and around just above the heel; then brought it forward around and across the end of the bandage and hollow of the foot, about which we passed it three times, drawing it very closely each time, which brought the outer edges of the foot so as to resemble the hand when pressed upon the sides, forming a longitudinal hollow in the centre. The board was then applied to the bottom of the foot, over the bandage, which was then drawn several times around the foot and board, together, thus bringing down the foot to its natural position. This reduced the bones to their natural place; and as soon as the operation of dressing was over with, the lady arose from her chair and walked, for the first time since the injury had been received, and never had any further trouble with it.

TO STRAIGHTEN A CROOKED LEG OR STIFF JOINT,

When caused by contracted muscles.

Give the stimulating medicines and keep up an active circulation through the whole body. Bathe the feet and legs in hot water, in order that the muscles throughout the system may receive as much warmth as possible, thus becoming very elastic. Wipe the parts dry and bathe them with hot drops and nerve ointment or stimulating liniment. Then put the contracted limb while yet full of elasticity, on to a straight board and swathe it down as near straight as practicable. Continue the hot medicines, and bathing the limb with hot water and ointment at night, and with the ointment alone in the morning, and at each time straightening the joint on the board by drawing closer the swathe or bandage; the same may also be done at noon.

At each application endeavor to bring the joint a little straighter or nearer the board than at the preceding time. By following this course many cases of crooked limbs may be made straight.

THE FEET! TAKE CARE OF THE FEET!!

Let this be remembered by all.

This important admonition cannot be repeated too often. Three quarters of our diseases come on by the feet. Young ladies get the consumption by their thin slippers and silk stockings. They expose themselves in the ball room after over exercise, by sitting down where it is cool. After leaving this place of amusement they communicate to the body a chill that is most pernicious through their shoes. Young gentlemen get the rheumatism, indigestion, pleurisy and catarrh, by their thin pumps. Young mothers get the ague in the breast, the milk leg, costive habit, fever and dropsy, by the extremities becoming too cold and an obstructed perspiration taking place.

Dyspepsia and nervous debility is brought on by the feet becoming cold, the circulation becoming thereby crowded to the head, by which means the bowels and stomach suffer for the want of an active circulation in the lower extremities.

THE REMEDY.

In the first place make pride bow to convenience, comfort and health in all things. In the second place see what the wants of the body require to make it comfortable, and supply those wants without regard to

the opinions of others. This *fear* of what Mr. A. Mr. B. or Mrs. C. or D. will say, is what has killed its tens of thousands. Therefore, a perfectly independent feeling of what others may say or think as to our dress and appearance, if it be decent and comfortable, is one of the first important requisites to preserve and secure health. In cold weather secure the limbs with flannel undergarments, drawers, and woollen stockings. Put into the bottom of the boots or shoes, inside next to the feet, cork soles or bottoms, which are furnished in small sheets for the purpose and may be trimmed down to fit the bottom of the boot or shoe. These corks will keep the feet dry and warm and if the water soaks through the bottom so as to moisten the corks, the feet will remain warm, as the cork will not absorb the wet, consequently will remain dry. Old hat may be used instead of cork, as a substitute, where the former cannot be had. This part of keeping the bottoms of the feet warm, is of the utmost importance to preserve the body from disease, and more especially the lungs, liver, and digestive powers. Those persons who take violent exercise in their pumps should always have thick shoes or boots with cork or hat soles, to protect the bottom of the feet against the cold when about to be exposed. The benefit of cork soles may be more highly appreciated by those who have been subject to lung complaints, headache, cholic, rheumatic pains, pleurisy, &c, than those who enjoy good health, and make use of the means as a preventive against the attack of those complaints. The feet being guarded as above and kept warm, the body requires less clothing to keep it comfortable; therefore economy as well as health requires that the feet should be well protected against the cold.

TO PREVENT FATIGUE AFTER EXCESSIVE LABOR,

Or after having exhausted the vital or muscular energy by excessive perspiration, before and after the commencement of chills.

When the exercise is over, do not sit down until you get to a stove or fire, and then place your back to the heat. In that way the greatest force of the heat will be felt between the shoulder blades and down the back, so that the *medulla spinalis*, or spinal marrow, will receive the greatest possible influence from its direct application. The quantity of warmth received by absorption by the spinalis is distributed through the body by the nerves, and the comfort and rest experienced by the person through the whole system while the radiation of heat is in process, is pleasant beyond conception.

When the system has thus replenished its vitality, and every part of the body has become warm, a scalding sensation is experienced on the back, to show that the system is as full of warmth as the wants of the body require.

The absorbents take up heat so rapidly when a person is very cold, and the system is filled so quick with the warmth, that it reacts upon the surface, meets the direct rays of heat, and creates of a sudden, a sensation or impression that the back is burning or scalding. When the last described sensation is experienced, those who will be at the trouble will find the veins full of blood, both in the hands and feet, and if they attempt to exercise, the inconvenience of excessive labor will hardly be felt, and they will feel much refreshed and invigorated.

Those persons who are troubled with lung difficulties will experience lasting benefit by the frequent application of this warmth, as the writer of this article knows by experience.

The most direct way to affect the lungs by external heat is by the

back; and those who have taken serious cold may be benefitted by remembering these admonitions, if they do not consider them too simple.

INJURIOUS EFFECTS OF THE YOUNG SLEEPING WITH AGED PEOPLE.

When young people sleep with the aged, it will be perceived that the senior will grow vigorous, while the younger will become pale and wan in appearance, dejected in spirits, and enfeebled in constitution. The old person literally becomes young, and the young one old. The reason is perfectly plain. The two becoming bed-fellows, an equilibrium soon takes place in the warmth and vigor of their bodies. Thus the old person preys upon the vigorous and active system of the young, by absorption, or by giving new life to the old, while the young person in the same degree partakes of the inert principle of the aged. In this exchange, the young person parts with that principle which sustains vitality and prolongs life, and obtains the infirmities and impotence of age. In a degree it may be truly said, it is life to the aged, and death to the young.

HEALTHY ABLUTIONS.

Bathe the whole surface of the body with cold water every morning on getting out of bed, then rub smartly with a coarse napkin to raise a cutaneous excitement. This produces a healthy action upon the skin, giving the young a robust constitution, and makes the aged more rugged, and less liable to suffer from fatigue or changes in the atmosphere.

By making it a constant practice, the muscular system will become more firm and solid, the person will be much less liable to take cold, will require less clothing, and feel more strength and animation. This should be remembered especially by weakly females and all debilitated persons; but let them previous to the bathing take warming medicines, to prevent taking cold.

SPRAINED LIMB.

It may be thought strange by some that an *emetic* should relax the muscles of a sprained joint, and reduce its swelling; but that such is the fact, we can testify from our own personal experience.

We sprained one of our ankles when young, which became so much swollen and so painful that we were unable to walk. But by taking an emetic of the tincture of lobelia, and applying a cloth wet with whiskey and water to the affected part, in six hours the swelling was entirely reduced, and we were able to use the limb comfortably.

During the continuance of the perspiration, the cloths were wet several times, the fever drying them rapidly.

A HEALTHY BEVERAGE FOR LABORING PERSONS.

Put two tablespoonsful of brown sugar into a pint of cold soft water, or the best drinking water you have, and keep it for a constant beverage in hot weather. This is one of the most healthy drinks that can be used to keep up the tone of the system. A teaspoonful of ginger should be added, which will render the drink more desirable either in hot or cold weather. In the warmest weather this will keep the body cool and comfortable, and give vigor to the system and an ambition for business.

THE VIRTUES OF HEMLOCK.

TO BE REMEMBERED IN BILIOUS COUNTRIES.

In unhealthy countries where the water is stagnant, let it be made into tea, by having hemlock boughs boiled in it, to prevent the injurious effects of the water, and if used as a constant drink it will keep off all putrid disorders incident to such places.

People who work in swamps, or low, unhealthy places, by using this constantly will avoid disease. Try the experiment.

RED RASPBERRY LEAVES—*Rubus Strigosus*,

A SUBSTITUTE FOR IMPORTED

TEA—*Thea Chinensis*.

We have been in the habit for some time past of using the red raspberry leaves as a substitute for imported tea, and most of our people prefer it. We think the flavor superior, and certainly the article is far more healthy. The two kinds of tea are prepared for each meal, and the raspberry is preferred by most of the members of our family.

Let our readers try this experiment for two or three weeks, and our word for it, they will arrive at the same conclusion that we have.

Children and others who make use of this tea will not be troubled with diarrhœa, dysentery, or sore throat or mouth.

To Practitioners.

INTEMPERANCE.

A course of medicine should not be administered to any person while in a state of intoxication—as the volatile properties of the liquor will receive a fresh impetus, and press violently into the head, and the subject exhibit the wildest paroxysms of madness, from the use of the steam bath and the other stimulating applications that would naturally be applied by a skillful practitioner, to produce a salutary operation or course.

We believe that there is danger of apoplexy in a case of this kind, by too great a pressure of stimulus upon the brain. The stomach should be clear of alcohol for our stimulating treatment to produce happy results upon the constitution. The worst effects produced upon the system, to appearance, are by the application of the vapor bath. In some cases in which it has been used, the alcohol has become so volatile, and forced its way to the brain with such rapidity, that the patient would force himself from the bath, and it would require the strength of several persons to keep him under subjection.

TO CURE INTEMPERANCE.

People who have been subject to hard drinking should not be broken off too suddenly, as it will prove deleterious to health, and in many instances fatal to life. Let the following course be adopted.

Take a quart bottle full of the favorite liquor that one has been accustomed to drink, with the usual strength. Let the inebriate take his glass as usual, then let his friend add to the bottle a glass of water for each one taken out,; and so continue to add a glass of water as often as he takes a glass of liquor, by which means the spirit is gradually reduced, and its consequent stimulating effects upon the body are gone, leaving nature to make up the deficiency in vital energy, by an appetite and suitable nou-

rishment. If it is thought proper, a tablespoonful of the tincture of lobelia may be added to the bottle at the time the water is put in.

In no instance should the liquor be taken away at once, but it should be done by degrees, and something substituted upon which nature may rely for a more congenial support. Aged persons, in this case, should be dealt with very cautiously.

ANOTHER EFFECTUAL REMEDY.

Whenever the time arrives that the thirst or hankering for the liquor takes place, which is usually about the time for taking the bitters, (say eleven o'clock) substitute milk instead of the liquor, and it will effectually do away the inclination for the liquor in a few days. Nature receives from the nourishment of the milk a stimulus far more genial and lasting than that from the liquor. The body will be invigorated, the mind made clear, and perhaps a disconsolate wife and suffering children made happy.

To Public Speakers,

OR TO CLERGYMEN, ORATORS AND LAWYERS.

Take care of your animal warmth in time of speaking, or supply yourselves with fuel before you commence the voyage.

Men have naturally allotted to them animal warmth sufficient to carry on respiration and for oral purposes; but when long continued or animated speaking requires an extra supply, that from the extremities is called in, to make up the deficiency at the vitals. If the person be slender, or thin in flesh, his warmth is soon exhausted by excitement and rapid speaking, and he becomes weak for the want of material to give rarification to the air that is taken in by respiration. In such cases, artificial means should be resorted to in order to give the system a supply for such emergencies.

We remember the case of a reverend gentleman, who was slender in body, excitable, and nervous in temperament. He would become so completely absorbed with his subject, and engaged when preaching, as to use up the natural warmth of his body by his quick respiration and rapid speaking. From being pale, his countenance would become lighted up and florid; and if he for a long time continued speaking, a purple hue of the countenance, a dulness of the eye, and a languor of the body would follow, succeeded by fainting, unless he had presence of mind sufficient to sit down, or stop in season to prevent it. "What shall I do to avoid these feelings? said he to me. "Open your mouth less, and then more temperately, or on setting out carry a sufficient supply of fuel to last till you have arrived at the end of your voyage," was our reply.

"And how," he enquired, "shall I supply myself with this fuel?" "Take a dose of cayenne or composition when you go into the desk." This advice he followed; and to our enquiries, soon after, what was the effect of our advice, he replied, "I could perform, it seems to me, if necessary, a second service with as much ease as the first, it gives me such a spring; it seems as if I was almost inspired with new life."

So we admonish you, gentlemen clergymen, orators and lawyers, to lay in a good supply of fuel before you commence speaking.

Black and White Population,

AND THEIR LIABILITY TO DISEASE IN BILIOUS COUNTRIES AND HOT CLIMATES.

Why are the white population in tropical countries more subject to putrid diseases and death than the blacks in the same climate! It is well known that the white people of high northern latitudes cannot live under the equator, like the blacks or native inhabitants, without being subject to violent attacks of bilious complaints, such as yellow and bilious fever, or black vomit, until after they have become accustomed to the climate. Let us look for a moment at their different complexions, and the part that color acts upon the system, in promoting health and generating disease.

In philosophy, it is well understood that black will absorb the rays of heat and light, and that white will reflect them.

Put a piece each of black and white cloth upon the snow, and the black will make its way to the ground, while the snow under the white will hardly become affected in the same temperature. The fact is, the black cloth absorbs the heat, and exhausts its influence as fast as it is received upon the snow beneath, while the white reflects nearly all the heat; consequently the snow is not melted in the same degree beneath. The same is the case with people. The blacks absorb sufficient heat from the surrounding elements to keep up vital energy, with the assistance of cayenne pepper, which they eat in abundance, both in the crude state, in soops, and in many other forms, which enables them to carry on respiration and perspiration with a great degree of comfort and ease; by which means they throw off by the surface a large quantity of morbid matter, which would (where there was not sufficient vital heat absorbed to keep up the proper degree of circulation) accumulate within, until every avenue of the body would become full, when nature would make a powerful effort by evacuations to throw it off, by what is usually termed the black vomit, bilious fluxes, or yellow fever, or till death terminated the sufferings of the patient by mortification. Inasmuch as nature is not able to take up by absorption warmth sufficient to carry on perspiration, in the same proportion should the person make up the deficiency and promote perspiration by the use of pepper or some other stimulus, to promote the secretions or evacuations of the body to such a degree as to throw off the excess of matter that the perspiration has failed in disposing of.

The white man reflects the heat, consequently vitality cannot be kept up but by the assistance of forced efforts; he becomes faint and languid, with a loss of appetite. The stream is nearly level with the fountain, or the temperature upon the surface rises nearly as high as that within. This will soon terminate his existence, unless by taking pepper or other artificial means he keeps up the vital heat, or keeps down to a proper medium that upon the surface; thus maintaining a gentle moisture and a requisite surplus of vitality to sustain respiration with ease until the person becomes accustomed to the climate, by changing the character and complexion measurably of the surface from a light to a dark color.

Mr. Jefferson once remarked, that in time the blacks would have full possession of the bilious portions of the low lands in the southern states; and the reason is perfectly plain. Where the sun pours down the greatest power of its rays there vegetation is the most abundant and luxuriant. The blacks are enlivened and invigorated by this heat, consequently it is a means of increasing and perpetuating their race; while by the same air

and climate the whites are enfeebled both in body and mind, and therefore will decline in population in the same proportion as the blacks increase.

Why is it not as necessary for the blacks to emigrate north during the summer, for their health, as for the whites? Are they not by their habits equally and even more exposed to disease?

The amount of vegetation that is constantly going to decay, is much more where the soil is rich and the atmosphere hot, than where the soil is less rich and the atmosphere more temperate and healthy; consequently, the amount of morbid poison is proportionately larger in the former than in the latter case, and of course more unhealthy. Such a place is best adapted to those people whose complexions are such as will with the greatest facility exhaust by perspiration the morbid poison received by respiration. This is the case with the blacks; they can live and prosper in the everglades of Florida, where the atmosphere is almost present death to the white man, who cannot keep up sufficient vitality to eject through the skin, the morbid poison received by the lungs into the body by respiration; consequently he is a subject for bilious or yellow fever, black vomit, &c.

A resort to high lands in hot weather is a remedy for diseases incident to low grounds; but in all cases make a free use of the pepper.

Let these our views of the operations of the different complexions, and their influence upon the body, be thought of by those who would study the cause and effect of diseases upon the human system, and also the climates best adapted to both health and disease, and our errors upon the subject corrected, if those views are erroneous.

INFLUENCE OF CLIMATE UPON MAN.

The effects of malaria on the range of human life, may be illustrated by a few facts. M. de Warville says that he has seen in the dry, healthy parts of America, women of sixty or seventy years of age, with an air of freshness, and sparkling with health; and that in many places one person in nine attains the age of eighty years; while on the low island of Oerlon M. Moheau states that there are not more than five or six octogenarians in fourteen thousand inhabitants. The limit of life in Switzerland is placed by M. de Moivie at eighty-six years—while in Georgia, it is stated, that white females born there very seldom attain the age of forty, and men rarely that of fifty years. Out of a thousand persons born at Vienna half of them do not live to be two years of age—whilst in the province of Vaud, in Switzerland, five hundred out of a thousand persons born there live to be forty-one years old. At Petersburg, in Virginia, it is said that no white person born there has ever attained the usual middle age, and then the body appears quite decrepit and worn down, although no severe sickness had been endured; and on the west coast of Africa white children born there seldom attain ten years of age. This is strongly contrasted with the health of the people of the capital of Norway, where there is but one physician among thirty thousand inhabitants.

The preceding remarks sufficiently demonstrate the effects of climate and soil even on man, who, of all animals, is best capable of defending himself against the consequences of the deleterious elements; for it cannot be denied, that in some countries his mind as well as his body arrives, with great rapidity and but little vigor, at maturity, when, without any perceptible intervening period of manhood, the corporeal structure hastens in an equal ratio of celerity to the grave. This fact is, however, but

a part of the universal law of nature—that whatever is rapid in its growth is equally speedy in its dissolution. The horse and the poplar quickly reach their height, gracefulness and beauty, and are short lived; while the elephant and the oak require nearly a century to obtain their vastness, strength and grandeur, and flourish in all the pride of majesty for ages.

DIRECTIONS FOR NORTHERN PEOPLE

WHO VISIT LOW LATITUDES DURING THE SUMMER, HOW TO AVOID BILIOUS DISEASES.

Wear black or red flannel under wrappers and drawers, fitted as snugly to the body as possible, and let your outside garments be made of brown linen or black bombazine. By this course the body will absorb sufficient heat from the atmosphere, by the aid of the black, to keep up vital energy; thus you will in a great measure obviate the inconvenience arising from a light complexion.

Let the food be of soups, well seasoned with pepper and salt, and take daily a few pepper pods, and you will be likely to avoid in a great measure the horrors of the diseases incident to a bilious country.

Let the clothes be often changed, and a great regard paid to cleanliness.

Let also a strong pepper sauce be freely used, made of a wineglassful of good vinegar, a teaspoonful of the best cayenne, and two teaspoonsful of fine salt. Stir this well together, and let it be kept in a phial or teacup for use. It may be shaken or stirred well together, and a teaspoonful taken half a dozen times a day. This is an excellent remedy against all putrid difficulties incident to low bilious countries.

USEFUL BEVERAGE.

Again.—If the people at the south would import from the north a good supply of hemlock boughs (*Pinus Canadensis*) to be used instead of tea during the summer season as a common beverage, they would not be as liable to the attacks of putrid complaints. The tea may be made of the hemlock in the most stagnant water, if it be well boiled. Let it stand for a constant drink or beverage during the day.

Let our southern friends try this remedy as a preventive of yellow, bilious and other putrid complaints, and they will not regret the experiment.

The person who makes use of this tea, will not take cold in northern latitudes by ordinary exposure to wet or cold. It acts powerfully upon the kidneys, and is a valuable diuretic.

The Asiatic Cholera.

A PHILOSOPHICAL THEORY.

In coming before the community with a theory so entirely novel, relative to the cause and effects of a disease, which the most learned of the known world have thus far pronounced as being beyond human research, we do it with a consciousness of our inability to do justice to the subject. We are therefore in hopes that our more enlightened friends will have the goodness to point out the fallacy of our reasoning, if we are in error, as

we are ever ready to confess our ignorance, and are always ready to exchange it for an equal share of useful knowledge, from whatever source it may be derived.

We have always been doomed to accompany the unfortunate few that are destined to stem the current of life, against the torrent of prejudice and abuse that is always ready to break like a mighty cataract upon any who presume to offer an opinion that shall in the least differ from the old established track. But our destiny has been so long established, that the arrows of persecution and the darts of prejudice have lost their sting. We give our opinion, if it be ever so erroneous; for how can our tutors rectify our errors, unless they are acquainted with them? We therefore advance our opinion, but shall ever claim the privilege to embrace the principles of a more correct theory, as soon as our opponents will convince us of the fallacy of our arguments, and have substituted in their stead more rational ones.

Man, like a machine, is under the control of a regulator, and that regulator is the mind. He is composed of the elements, and his existence is dependent upon a certain tone or temperament the composition has received. Like a commander in chief of an army, the mind commands the members of the body individually or collectively. If the eye, as the sentinel of the body, sees the danger, the mind by the eye is immediately informed of it, and the limbs are directed to flee, or otherwise act, as the emergency of the case may require.

Should the destruction of one or more of the members take place, and the mind remain unimpaired, we should perceive at once the disability of the body to perform its usual functions. The mind is sensible of the deficiency of the members under her command, or of the body corporate, from which it has received no injury, but still remains as strong as before any injury was received by the confederation. But when the mind is mpaired by loss of reason, the whole body corporate suffers comparative shipwreck, in consequence of the guide or regulator being impaired or gone. It is like a ship that is unmanageable—left entirely to the mercy of the waves—or like a powerful engine, that is under motion without adequate means by which it may be controlled.

The ear can hear, the eye can see, the nerves feel, the limbs act—but not with judgment, without the direction of the mind.

The principle of life is given us, and the desire to retain it; therefore when danger occurs to the body corporate, we have a greater dread of it than if it would only injure a part of the confederation. Like fruit, man comes to maturity and then goes to decay; and the means that will continue him sound and prolong his days for the longest period, are what he is ever in pursuit of.

When any unusual mortality visits his neighborhood, and his friends begin rapidly to fall around him, the eyes and ears inform the mind of the danger of the body, and the limbs are immediately directed to flee with the body to a safe retreat.

It stands us all in hand to guard ourselves against the enemies of our existence; and being philosophically constructed, it is important to search out the immediate and remote causes of any calamity that may attend us, or threaten our common country, and to reduce the cause as near to a mathematical demonstration as the circumstances of the case will admit, in order not only to shield ourselves, but our friends, and thereby furnish the means, if possible, to perpetuate our existence. Fear rests on the mind in proportion as the place where the person resides is subject to dangerous or pestilential disease. There must have been some principle in the atmosphere during the cholera, which was more destructive to human life than at other times.

Therefore, the object of the writer now is, to dwell upon the immediate and remote causes of the Asiatic cholera, in a philosophical point of view, and endeavor to show as far as we are capable, in our own way, by what particular agency man should be more rapidly cut off in the time of cholera—during that fatal season—than at any other time. We believe the remote cause of cholera was an unusual destruction of animal and vegetable matter, during violent and sudden changes of the weather; and the direct cause, the excess of nitrous or morbid gas, that was extracted by the power of heat from the decaying mass, during the summer weather.

By keeping the foregoing views in mind whilst perusing what follows, the reader will be better able to judge of the philosophy of our argument as we progress.

It will be remembered, that in September, October, and November, 1831, preceding the cholera, we had our finest and best weather. During that season, all nature appeared beautiful and gay, and vegetation was clothed as it were with summer verdure. Insects were lively, and the whole face of nature was clad in its summer garb during the fall, as late as about the 20th of November, when winter set in. To-day, as it were, the sap of the plants was in their top, and there was no visible preparation for winter, as would naturally be expected at so late a period during common seasons in the same month; and all species of insects were lively, and there appeared to be no preparation for winter; when in an hour, as it were, cold weather set in. The change was so great that the sap in plants was frozen, by which they were destroyed in great abundance, and the sap in young fruit trees, in many instances, was frozen between the cam and the wood, by which the bark was raised, and the tree partly or entirely destroyed. In that way young trees suffered more from the 20th of November to the 20th of June following, than for fifteen preceding years.

To verify this statement, we have only to say to the horticulturist, the gardener or the farmer, take a retrospective view of the fall of 1831 and the winter following, and see if cold weather was not more destructive to the vegetable matter than they ever knew it to be for the same space of time. Myriads of insects were overtaken and destroyed, in consequence of becoming stiffened by the cold before they had time to get to their winter retreat. We presume there is no account on record since the settlement of North America, of so great a phenomenon in the weather as took place in the latter part of the month of November and the fore part of December, 1831. The severity of the winter of 1831–32 preceding the cholera, far exceeded any winter that has been experienced by the oldest inhabitants of the country. From the time when winter set in, we had no weather sufficiently warm, by which the nitrous gas could be extracted from the substance in which it was generated, as has been the case in regular seasons. For in common seasons there is warm weather enough in each month to exhale the poison that has accumulated during the same time, which is done gradually; consequently the injury to the inhabitants will be light in proportion to its gradual escape. The large quantities of gas which are exhaled in the spring, is what causes the peculiar faintness felt at that time, and is what cuts off the inhabitants, and especially the aged, more than at any other season of the year. In the fall, the frosty nights and hot days have the same effect upon the inhabitants, in proportion to the quantity of tender herbage and animal matter that had suffered by the frost, the poison of which is exhaled during the hot days, from which it is frequently said in relation to consumptive people, if they do not die in the spring, they will live till about the falling of the leaves in autumn.

The large quantity of matter that had accumulated in consequence of the sudden change in the fall of 1831, and the long and severe winter, throughout the country, had not exhaled its malaria or poison into the air, as is common, in consequence of the severe cold weather; and the accumulations of six months were to be disposed of when hot weather set in, about the middle of June, 1832. The exhalations of nitre from this mass of morbid matter, is what we believe destroyed so many inhabitants during the cholera.

Nitre is generated in the greatest abundance in valleys and low grounds, where dead animals are left to decay, or where large quantities of vegetable manure have been deposited, or on the banks of rivers, in swamps and low marshy grounds; and all rich soils have an abundance of it. Fogs in low lands are considered unhealthy, and they are so, in consequence of the nitre they contain. Nitre is the most powerful refrigerent ever used in medicine. In consequence of its cooling properties, it is administered in fever powders to kill the fever, so called, as vital warmth cannot exist but a short time if that is used in any considerable quantities. The effects of nitre, or salt-petre, are well known to such as have by mistake taken it for salts, if they have been fortunate enough to get rid of it without the loss of life, as many have been thus killed. The Edinburgh Dispensatory says this powerful salt, when taken inadvertently, is one of the most fatal poisons.

We therefore see that nitre is a deadly poison, in substance, and why not in gas, in proportion to its density?* It is always found in caves, cellars, valleys, under barns, and in places the most retired from the rays of the sun. Heat is the only thing that will act upon it; and when the gas is extracted, it forms the heaviest part of the air, and, like the substance from which it is taken, seeks the low grounds, and valleys, and the streams of water, the latter of which it follows, and is emptied into the valleys of larger streams, each of which contributes its part of the poisonous fluid, and the amount is in proportion to the extent of territory, the quantity of low marshy ground, alluvial soil, and of animal and vegetable decomposition from which the water has flown.

The greater the number of streams that unite, the larger and more dense the quantity of nitrous gas which settles down and follows the streams. It is invisible to the eye, but in shape and movement the same as fog to the sense of sight.

It will be remembered that the cholera did not make its appearance the first warm days—not until we had several of them—and the country adjacent had sufficient time to give out gradually her poison, and it had floated down the valleys upon the bosoms of the streams, and become united in one dense body of gas, in the valleys of the Hudson, St. Lawrence, Ohio, Missouri and Mississippi rivers; and then it was reported that the cholera had made its appearance in such a place, on such a day.

And in our opinion the disease raged until the country had exhaled its excess of malaria; and as the nitre diminished in quantity through the country, the supply of the streams was less, the gas became less dense, the people inhaled a less quantity of poison in the same quantity of air; consequently the disease began to subside, gradually, until the fountain was dried up in the country, when the effects entirely disappeared in the cities.

The effect of saltpetre when taken in too large quantities, in a solution

* It has been ascertained by a system of experiments in England, that the weight of atmospheric air was considerably greater during the prevalence of the cholera in that country than usual, by which it would appear that some heavy foreign body had been diffused through the lower regions of the atmosphere about that period, and was in some way connected with that disease.

from a crude state, is a distressing chill through the whole system, attended with violent cramps at the stomach and limbs, a cold sweat upon the body and extremities, which is on account of the refrigerent qualities of the article, which is rapidly destroying the fire of life or the vital heat. The temperature of the surface of the body being reduced below that of the air, the atmosphere immediately condenses upon the body, which is the cause of the excessive moisture upon the skin, a purpleness of lips and finger nails, a contraction of the skin upon the hands and feet, and death terminates the life of the poor sufferer in a very short time, unless some very active stimulants, antiseptics, and emetics are used to keep up the heat, and eject the morbid matter from the stomach.

The cholera is generated under the same principle, according to our theory, in receiving the nitre in form of gas into the blood, through the lungs gradually, by which means the system is poisoned equally throughout, and the patient does not suffer the distress that he would, to take a dose of saltpetre into the stomach, when hale and vigorous, and while the person was yet in a pure atmosphere. The subjugation of the principle of life, that has supported a large muscular system, cannot be done without a powerful struggle. The same body could be overcome with comparative little distress, except the contraction or cramp of the muscles, when the atmosphere is infected, and every breath is reducing the principle of life through the whole body, and, of course, every one of the senses become blunted or deadened, in proportion as the fountain or vital principle gives away, to what it would be to attack it in full vigor of strength with saltpetre. The oxygen of the blood is destroyed by the intrusion of this gas upon the lungs, the blood becomes purple and thick, the eyes are sunk back into the sockets, and nature raises a feeble effort to remove the poison from the system by vomiting and relax, by which means the vital warmth is again reduced, in rarifying or raising the heat of the fluids to the temperature of the vitals, before it leaves the system. By this means the vital heat is rapidly carried off, and to make up the deficiency, the warmth in the extremities is called in to support vital action, which leaves the flesh to contract, the muscles to cramp, and the quantity of water which has been thrown into the extremities by the heat, to carry on perspiration, is drawn back into the body, by the contraction of the flesh from the surface, when the heat leaves it and goes off in what is called the rice water discharges, by which means the limbs become much reduced in size. The warmth of the extremities being left so much below, or colder than the temperature upon the surface, that the air condenses upon the skin, in what is called the cold sticky sweat. This principle may be strikingly demonstrated, by putting upon the table in a warm day in the summer, two tumblers, one filled with hot and the other with cold water; the latter will sweat, the air having condensed upon it, while the former will remain dry. Nitre is used in connection with salt, to cure meat, and those who are in the habit of putting up hams, know that the larger the quantity of nitre used, the less the salt will take hold, so that many of the hams after being smoked will taste nearly as fresh as the meat would when it was first killed. By this we see that nitre is an anti-septic, and has a tendency to keep the flesh from decomposition. In case of cholera, whoever saw a patient that had mortified or become putrid before death, or that had any visible signs of mortification before it was buried, if the interment took place within six or twelve hours after death? The flesh of a person who died of cholera, was several degrees colder, if we could judge from the touch, than one who had died from any other complaint. It felt nearly as cold as a stone, the fibre was more closely concentrated than in the cases of death from other diseases, all of which we attribute to the refrigerent properties of nitre. The

galvanic battery would not operate upon a person who had died of cholera, which was an evidence that the body was destitute of oxygen, or electric fluid.

When has the time been before, or since 1832, that there was as little electric fluid in the air ?—in the vicinity of Albany we had but two or three thunder showers during the summer, and then the clouds flew high and with but little lightning.—The heavens were of a death-like hue or a whitish yellow color from the horizon to the zenith. The Aurora Borealis, or northern lights, were scarcely visible during the summer. There was none of the florid appearances in the heavens that are usually discoverable at evening about the horizon in healthy seasons.

It has been our opinion, and the facts have justified the conclusion, that from the temperate zone, or from about the latitude of Philadelphia, north and south, the cholera has raged with gradually increased violence, and as far north as Quebec, and south to New-Orleans, we are all too well acquainted with the fatality that attended the complaint to doubt for a moment its wide spread sweep of destruction. In the frigid zone the sudden and violent changes of the weather must have had a powerful effect upon animal and vegetable matter, and in proportion as it was destroyed, the poison would arise during the hot weather into the air, and the inhabitants would be exposed and the number of deaths would be in proportion to the quantity of matter previously destroyed. At the south the rich alluvial soil and the large quantity of herbage peculiar to that climate shared the same fate as vegetation at the north. But if any thing, the south has a greater abundance of matter to generate disease, in consequence of having a greater length of time for the growing season than at the north. Therefore the air will be filled with a greater quantity of gas, and a fatality will attend the inhabitants in proportion to its density. See the accounts of the cholera upon the borders of the Mississippi, Ohio and Missouri, and at the north upon the banks of the St. Lawrence.

The report of the Massachusetts Medical Society published in 1832, states what observation has taught us to be the fact in this country, that in the East Indies the cholera avoided the hilly country, and that a range of mountains would arrest its progress in any particular direction, and after a long prevalence it found its way through the mountain passes and spread itself in the valleys beyond; also, that the greater part of the patients were taken during the night.

Now, according to our theory, the nitre during the day was exhaled into the air and became greatly expanded, so that the quantity inhaled by the breath was less than at night, when the absence of a vertical sun would be the cause of a heavy condensation of the atmosphere, which would concentrate the gas that would fall in heavy masses into the low lands, and heavy dews would cause the gas to become more compact, consequently the patient whould inhale double and perhaps treble the gas in the same quantity of air, which would poison his system universally, by means of the circulation of the blood, and every part being reduced alike, he would feel no pain until the warmth was called in from the limbs, by which the muscles would be left to cramp or contract, for the want of the expansive power of heat.

In consequence of the refrigerent properties of the nitre, the vital heat or fire of life is fast dwindling, and the vital principle is so far reduced that the remnant of warmth is not able to expand the chest, which has now become much contracted; and consequently respiration is labored and difficult, and the patient feels as if a heavy weight was laying upon his breast; and as life ebbs out the senses leave the body, and sensation gradually departs; the hearing becomes indistinct, the eyes blind, and he dies without a struggle, unlike a death produced by any other complaint,

and the remains show marks of the horror that dwelt upon the patient's mind while in life, from the powerfully contracted state of the muscular system, which had drawn so strongly upon the most delicate and sensible organs of the body.

It may be asked, if our theory be correct, what should be the cause of the second appearance of the cholera in the United States, along the Mississippi, Ohio and Missouri rivers, when there appeared to have been no uncommon change the fall preceding, like that of 1831. To this we reply, that in the spring of 1833, when those rivers broke up, the banks were overflown, especially those of Mississippi and Missouri, to a greater extent, as we have been informed, than for several years before. In some places the country was inundated for many miles each way from the beds of the rivers, and the water carried back and implanted a rich vegetable loam, or earth strongly impregnatnd with nitre, and in some instances several inches deep. When the water subsided, this alluvial coat was left, together with innumerable small ponds of water, which had settled in the concavities of the country for hundreds of miles along the rivers.

It is well known, that a level country will retain large collections of water after the rivers have fallen within the limits of their original banks. The water is dried down; the poison or nitre that is embodied in the loam in large quantities is more condensed, and is continually reducing, until from the very dregs the strong nitrous gas is exhaled into the air; it settles upon the stream in a condensed form, and floats down, inundating the cities; and as soon as it is strong enough, nearly every person of certain habits or of certain temperaments will be attacked, and the worst in body will die first.

In such cases, it has generally been said that the cholera made its appearance in such a place on such a day, and it continued to rage with great violence for a season, and when the filth and water had become reduced down, and the loam become dry, having exhaled all its moisture, (the means by which the poison escapes) the report then is, that the cholera has disappeared as suddenly as it made its appearance.

In order to reduce my theory to matter of certainty, as nearly as possible, I had recourse to experiments with the thermometer, both before and after the use of medicine, and the following is a memorandum taken at the time.

The course was to observe the point at which the mercury stood in the room; then I would draw out the plate from the case, and at the same time have the person recline upon a sofa, upon the back, and take the bulb into the mouth, against which he would steadily eject the breath from the lungs, and in about five minutes the mercury would rise and become stationary at the point of standard warmth of the body, which would be from two to ten degrees above the surrounding atmosphere, in proportion as the persons enjoyed different degrees of health.

Mr. Benjamin C. True, dye-cutter, No. 7 Beaver street, near its junction with South Market street, came to me in July, in much distress; his countenance was pale and ghastly, his cheek bones were prominent; his eyes were sunk back in the sockets, and he was attended with great oppressson at the lungs and difficulty of breathing, and a cold sticky sweat upon the surface. He had been run down to this state in about ten hours, and his symptoms in every respect were those of an approaching cholera of the worst kind. I informed him, that before I gave him medicine I

wished to try by experiment with the thermometer, the height of the animal warmth of the body, to which he readily assented. The mercury in the room stood at 88 degrees above zero, and he only succeeded to raise it to 92 degrees, showing the small difference of 4 degrees surplus above the surrounding air. I then gave him a glass of the cholera medicine, and in about thirty minutes it had wrought so much of a change as to raise the veins in his hands; his cheeks and lips became florid, and he felt quite smart. I then tried the thermometer again, and it gradually rose to 99 degrees, showing a difference or gain of 7 degrees by taking the medicine, or 11 degrees surplus above the surrounding air, instead of 4 degrees, as at first. He had no trouble after the first day, as his certificate will show.

My course was to restore the heat of the body to its healthy standard, as in the case of True and others, in order that the perspiration might return to the surface, and the heat to the extremities, by which means the sweat would pass off from the body through the pores, instead of a relax, which would stop, and the cramp would cease by the return of warmth to the muscles; after which, any gentle course that would clear the body of the morbid matter that had accumulated during the indisposition, would leave the system in a healthy state, with the exception of the debility occasioned by the disease, which would soon be gone. J. T.

Albany, Jan. 14, 1833.

The above experiment was tried upon me in the presence of several other persons, and what is there stated I declare to be correct; and I was much astonished at the immediate relief I obtained, and was more so, when I saw the change of seven degrees in the temperature of my system by the mercury. I had no more trouble after the first day.

B. C. TRUE.

Albany, Jan. 14, 1833.

I was present and witnessed the experiment upon Mr. True, and from ocular demonstration know it to be correct. I also had a similar experiment tried upon me, when I was nearly in the same state as Mr. T., and with the same success.

DAVID BENSEN.

Albany, Jan. 14, 1833.

We saw similar experiments tried at the office of Dr. Thomson, Beaver street, Albany, and with similar results as above.

R. E. WARD,
Of the firm of Many & Ward, 84 *Beaver street.*
JAMES HUNTER,
Late Associate Editor of the Albany Daily Advertiser.

Albany, Jan. 14, 1833.

I have seen the above mentioned experiments satisfactorily tried repeatedly, with the same success as above, and they appeared to me to be both philosophical and conclusive.

J. W. DOLBEAR.

Useful Observations,

TO PEOPLE OF WARM LATITUDES, OR LOW BILIOUS COUNTRIES,

WHICH SHOULD BE REMEMBERED.

MEDICINAL PROPERTIES OF SALT.

Dr. Stevens, an eminent physician of London, has recently made certain discoveries relating to the diseased and healthy state of the blood, and the agency of salt upon the circulation, which seems likely to produce a great revolution in the treatment of fevers, and malignant diseases in general.

It is well known that the blood of the arteries is of a bright crimson color, while that of the veins, which is returning to the heart after having spent its vivifying influence, is of a dark purple. According to Dr. Stevens, the bright red color, the vitality and the stimulating power of the arterial blood, are all dependent on the quantity of salt which enters into its composition; while all acids, alkalies, and in general all poisons, tend to blacken the blood, to reduce its stimulating powers, and of course to diminish the force of its circulation. The purple color of the venous blood is owing to the carbonic acid it has imbibed. In the lungs, the oxygen of the atmosphere removes this deleterious acid, and the circulating fluid then resumes a bright scarlet appearance.

According to his theory, poisons, and those malignant disorders, such as the marsh fever, yellow fever, &c., which originate from the patient having imbibed a febrile poison, are, in their very first stages, accompanied with a blackness and stagnation of the blood, occasioned by the destruction of its saline principle; and to cure the patient, this saline principle must be restored.

Take, for instance, the bite of a rattle-snake. In this case, the poison of the serpent's fang mingles with the circulation, destroys its red color and its vitality, brings on blackness of the blood, stagnation of its current, convulsions, and death. The unfailing antidote, which experience has taught the Indian to apply, is to scarify the wound to the bottom, and fill it with salt. The salt is taken into the circulation, restores the redness and vitality of the blood, and the wound soon heals. Malignant fevers, and other malignant disorders operate in the same way. They begin by destroying the color and vitality of the blood, and reducing it to a black and putrid mass; and, says Dr. Stevens, I have seen patients in the last stages of these disorders, recover under the internal use of large doses of common salt, and other saline agents; where the cases were at first so hopeless, that their recovery afterwards appeared to be almost a miracle.

The climate fever of other regions, and some other fevers are produced in a different way. A cold climate requires a different constitution from a warm one. In cold climates, the digestive organs are more vigorous, and the blood is rich, stimulating, and full of salts. The blood in southern climates is of a less brilliant color, thinner, and less impregnated with saline substances. When the constitution of a northern stranger is suddenly exposed to the influence of a southern climate, nature hastens to produce the necessary change in his circulation, and the change is generally accompanied with an awful disease. While the skin performs its functions of perspiration there is no danger; but the moment perspiration becomes obstructed, from imprudent exposure to the cold night air, or

any other cause, the fever breaks out. The reason is, that the blood is too stimulating, too full of salts, and the danger is, that this operation of nature for reducing it should be carried too far, and the blood so much blackened and weakened that the patient dies of mere exhaustion. These disorders, therefore, according to Dr. Stevens, in their first stages require the acid, in their latter the saline treatment.

If this theory of Dr. Stevens be true, a great step has been made in the treatment of febrile and malignant disorders; and certainly the universal use of salt as an indispensable article of diet, as far back as history carries us, and the craving which animals both wild and tame exhibit for it, would tend to prove that this condiment has some universal and essential effect on the bodily constitution.

REMARKS.

It will be remembered, that in our cholera treatise we attributed the complaint to the excess of nitrous vapor, that had been exhaled from the great quantity of animal and vegetable matter that was destroyed the preceding fall, and that the gas, being the heaviest part of the air, sought the low grounds, or valleys of streams, upon the bosom of which it floated down, and its density and fatality was in proportion to the extent of territory and marshy grounds that supplied the streams with water.

We also endeavored to show that nitre was a powerful refrigerant, and had a tendency to destroy animal warmth, for which purpose it was used by medical men to kill the fever, and we quoted medical works to prove our position. Also, that nitre possessed of itself a principle that would destroy salt as well as life. To prove which, we mentioned the fact of its being extensively used in curing hams, by the nitre preventing the salt from taking hold as it would if the salt-petre had not been used, by which means the hams are kept much more fresh than if they had been cured by salt alone.

The places where nitre is generated in the greatest abundance is in swamps, marshes, and upon rich alluvial soils; and such are the abiding places of yellow, marsh, bilious, and many other kinds of malignant fevers, in proportion to the density of the gas, from the greater or less quantity of decomposition.

The air is impregnated with the nitrous gas in those peculiar low grounds; the person inhales constantly its deleterious qualities; and the refrigerant properties of the nitre not only destroy the oxygen in the air, but inhaling it upon the lungs, the salt or preservative principle of the blood is destroyed, the blood becomes morbid, and thick or sizy, and of a dark or blackish red color, and thus the foundation of putrid fevers is laid.

If putrid and malignant diseases do not originate entirely from the excess of nitrous gas that escapes from the animal and vegetable decomposition in swamps and low grounds, by destroying the stimulating properties and salts of the blood, and by infusing a great quantity of nitre into the air that we breathe, how does it happen that the yellow fever and other putrid complaints are not prevalent upon mountains or high lands! In order to preserve the natural temperature of the blood, we should in the first place seek a pure atmosphere, by resorting during the sultry seasons to high grounds, as it is well known that pestilential diseases remain in the valleys.

It is also a well known fact, that where pestilential diseases rage with great violence, the air is almost entirely destitute of electric fluid, which was the case in Albany during the cholera, as we had but a trifle of thunder or lightning during the prevalence of that complaint. It was also the case it other parts of the country.

We believe that pestilential diseases of every grade are brought about by animal and vegetable decomposition, in its various stages of decay, some of which are more favorable than others. For instance, there is a constant growth and a constant decay, in nature, in process at the same time; and it is in the power of the elements to increase or decrease the amount of disease, in proportion as the seasons are regular or irregular. For one extreme often follows another.

If we have an unusual space of dry weather, the decayable substances do not diminish as fast as if we had alternately dry and wet weather. For in a long series of dry weather, the fluid part of the substances which are decaying dries up; and should a drought continue for a number of weeks, the stock of materials for decay is constantly and rapidly accumulating, and the quantity that remained when the drought first set in still continues nearly in the same state as when the drought overtook it, with the exception of the small portion of moisture which it had formerly contained, and which was soon annihilated, leaving the substance behind to become a fresh source of disease, in conjunction with the increased accumulations.

In what we call regular weather, the morbid matter which accumulates by nature, except in some extraordinary cases, evaporates into the air nearly as fast as it collects. Thus by its gradual escape the atmosphere is so slightly affected, that the quantity inhaled by an individual, if in health, is not so great but what nature in her daily operations works it off without any inconvenience to the person; consequently he does not think himself sick, or that he has been exposed to any thing that is deleterious. But how is it after a drought of several weeks, during which health generally pervaded the land? As soon as it rains any of consequence, and the sun again makes his appearance in all his splendor, the earth emits a hot disagreeable effluvia, which at once produces the head-ache and a faint sensation at the stomach. The morbid matter that was on hand before, and what has accumulated during the drought, has now become wet and is ready to exhale into the air, say in six days, what ought to have been escaping for six weeks. Thus the atmosphere becomes at once overcharged with that peculiar gas or poison from decayed substances, and the system, if healthy, is more active in absorbing it and hastening dissolution than if it had been in a morbid state; and it has a tendency to carry all living matter with it, to decay or death, which would be the case, if it were not that nature has implanted in every man a desire to live, and has pointed out remedies for him to use when this enemy to his existence attacks him. Notwithstanding his exertions, in proportion as he decays, in that ratio this perpetual curse to man gets the upper hand, until he is cut off by some disease, or old age can withstand its attacks no longer, and he sinks in death.

The climate fevers of the southern region, says Dr. Stevens, are produced in a different way; a cold climate requires a different constitution from a warm one. We should like for Dr. Stevens to inform us if the greatest number of attacks by fever at the south are not upon the low grounds where vegetation is the most abundant, and if said disease is not more liable to attack the inhabitants in warm weather, when the vegetable matter is in its most rapid state of decay? and if the disease will not be as much more fatal than at the north as the vegetable substances are more plenty, and the rays of the vertical sun are more intensely warm to hasten the decay? Also, we should like to know if the fever mentioned by the Doctor was not measurably brought about by the deficiency of vital warmth, which a northern man possesses when compared to a West Indian, which could not increase by absorption as fast as he gained in latitude traveling south? We would also ask if the facilities of the skin

are not increased in absorbing heat as the skin becomes brown or dark colored; also, if the Spaniards, Portuguese and West Indians are not in the habit of replenishing the vital warmth, inasmuch as they are overcome by the external heat, by a free use of cayenne peppers and salt in almost every kind of food that is used among them; such as soups in particular? Also, are not those peppers greatly used in their native state, and are called chincopins by the Spaniards, who keep them in their pockets for use, much the same as many of our northern people do tobacco?

Dr. S. will admit we presume, that black will absorb heat while white reflects it, hence the peculiar adaptation of the tropical climates to the black population and higher latitudes to the white population, for if a white man cannot absorb warmth fast enough to keep up respiration, the head and fall is lost as the miller would say, the outward and inward heat become equal, and as the surplus of vitality is gone, the man must die. Wherever the yellow fever has prevailed at the south, the black population, with the same care, have never been cut off in the same proportion as the whites. The blacks make free use of cayenne peppers to keep up vital energy and restore their health, while the whites live popular and die so, by the free use of calomel and other poisons.

The white missionaries, who a few years since went to the colony of Liberia, were very soon cut off by not understanding how to temper themselves to the climate, or in consequence of not adopting the remedies that the blacks have recourse to.

"Again," says the Doctor, "when the constitution of a northern stranger is suddenly exposed to the influence of a southern climate, nature hastens to produce the necessary change in his circulation, and the change is generally accompanied with an awful disease." The doctor does not inform us what this change is, and how it is brought about. But we presume the man having left a high for a low latitude, the heat is increased upon the surface much faster than the vitals have absorbed it, consequently in proportion as the heat vitally failed in keeping up by absorption with the increased warmth, so much cessation of motion took place, and in that proportion the vital heat failed in rarifying the water and other morbid matter, and throwing them clear from the skin by perspiration; and as soon as the heat was so much reduced as to fail in performing the office of rarification, the matter that should have escaped from the surface stops in the flesh for the want of assistance, the skin becomes clogged, dry and inflamed, the blood thick and morbid, the system is now fast filling up, and the patient will soon cease to exist, unless the first principle that was lost, that is the heat, can be aroused to action to assist the body in expelling the load with which it is incumbered and once more to produce a free perspiration, and by the use of other appropriate remedies remove the morbid matter that has been secreted in the body. The doctor admits that while the skin performs its functions of perspiration there is no danger. But he does not give a name nor a clue to it that we may know the cause why the skin ceases to perspire. Any of us know when we are sick and when we do not perspire; we also know when our friends are dead; but that is not the main thing we wish to know. We wish to learn what has brought about this change so that we may avoid the attacks or know how to effect a cure when once we are attacked.

The Doctor says that a northern person's blood is too stimulating and too full of salt, and the danger is lest this operation of nature for reducing it should be carried too far and the blood become so much *blackened* and weakened that the patient dies from mere exhaustion. Now if heat is the stimulant or principle that acts upon the water or fluids of the body to produce perspiration, how does it happen that a northern man when at-

tacked at the south with the fever ceases to perspire, if he has too much vital stimulant, and how does it happen that the blood becomes blackened if it is not destitute of oxygen or heat, or nearly of the same temperature as the surrounding air? We think if the Doctor had given his southern patients all the salt the blood contains instead of taking it away, and then added to the natural stimulant of the body by the use of half a dozen West India pepper pods daily, which the God of nature has expressly and so abundantly furnished there for them, the perspiration would not have ceased so soon, neither would the blood have become black for the want of natural stimulant or warmth.

We will here inform the Doctor that in the West Indies where the cayenne pepper is used the most freely, there the diseases peculiar to the climate are far less prevalent than where they are not used, and the native inhabitants seldom, if ever, have an attack of the complaints so common to northern people there. We will now ask the Doctor if it would not be better for a northern person to adopt the habits of the natives, in relation to medicine, who have tested their remedies and have fully tested their efficacy and safety in the complaints of the country.

Under all these considerations we would like to know if it is not the constant inhalation of the morbid poison in its greatest strength into the system, the reason why the common age of man in tropical countries rarely exceeds that of from twenty to thirty years, while in Norway, Sweden, Russia, England and the Northern States of America, they attain that of from fifty to seventy, and even sometimes to an hundred years and upwards.

If the operations of the vertical sun upon animal and vegetable decomposition is not the cause by which the great average of the duration of of life among the people in tropical countries falls short of those in higher latitudes. How is it that the blacks who have removed from those countries to higher or more frigid latitudes, so far exceed in age those of their own countrymen who remain in the low latitudes and even that of the white people in cold countries.

It is well known that the nurse of Gen. Washington, a black woman, reached the astonishing age of one hundred and sixty-five years, at which age she was exhibited at the north, and it is also true that a much larger proportion of blacks at the north, arrive at the age of an hundred, than of the whites. Such we believe are the qualities of a light and dark skin in hot and cold climates, in prolonging or shortening life.

Thus it will be seen that emigrating from low to high latitudes prolongs, while that from high to low, shortens existence.

Where the blessings of Providence are the most profuse, man is permitted to enjoy them the least length of time ; but where it is necessary for him to struggle and labor the most unremittingly for an existence, there his life is prolonged to the greatest age.

On the use of Physic and Intemperate Indulgences;

OR A COUNSEL OF THE SENSES

UPON THE INDISCRETIONS OF THE APPETITE.

Cathartics, the same as every other substance, have their good and bad qualities; and also require a discriminating mind to know when to use, and when not to use them. Like every other article, physic may be used with discretion and with indiscretion. We may as well say that

bread is not healthy, because if we eat a loaf of it we are made sick thereby, consequently a small quantity is injurious, as to say that because peach leaves, senna, castor oil, or pepper pods, in improper quantities, and at unsuitable times, will do injury, that there is no valuable properties in them, when given in such quantities and at such times, as experience may have taught beneficial.

Who does not know that steaming, properly administered on suitable occasions, and at a proper temperature, is a powerful agent in dispelling disease. And who does not also know the power of steam, when it is not subject to the control of a judicious engineer, has destroyed many thousand lives. Yet shall we say there is no redeeming properties in the power of the steam bath, when administered to the sick by a judicious practitioner?

These remarks in relation to physic, strongly remind us of the rules and regulations, which we once saw placed over the kitchen table, for the observance of the domestics, at the residence of a gentleman in Boston, Mass. which were as follows, viz:

"*The Rules of this house.*—Keep every thing for its proper use; keep every thing in its proper place, and do every thing in its proper season."

The whole theory and practice of physic may be embodied within the above rules and regulations. Every thing in nature may either be used in season or out of season; and the grand secret in the practice of medicine is to ascertain the appropriate times for their use. The knowledge of this fact is what constitutes the skillful practitioner in medicine.

The most healthy physic is that which is the most natural to the body. Hence the gall in sufficient quantities to move the bowels with regularity, without regard to the quantity or quality of the food taken in the stomach, is the best physic, and while that remains healthy artificial means to assist it in the performance of its office are unnecessary.

The abuse of the digestive organs by crowding the stomach with too great a mass of substances for its disposal, is what first causes them to complain. It is not honorable or just because a person is willing to work to heap upon him the labor and drudgery which two or three individuals ought to perform. So with the digestive powers. Because they perform their task with cheerfulness and fidelity, the epicure and gormandiser have no mercy upon these useful servants, but will crowd the stomach with a heterogenous mass to be disposed of by them with great labor. This admirable power of the human system struggles with the acts of the epicure, until overcome by excess in eating, drinking and other intemperate indulgences, and is obliged as is said in common parlance, to beg for help, that a little mercy may be shown it by a more temperate mode of living, or that some assistance shall be granted to enable it to perform the daily task which until this time, it has been able to accomplish alone. Until this time the mind has sided with the appetite, and the two united in overcoming reason, by which means they succeeded in imposing upon the digestive powers to a most unwarrantable extent. The mind now begins to find that it has not the capacity to act, and its domicil is not the place of peace and quiet which it was once. The appetite, taste, and relish have become vitiated, the feet complain of being cold, the bowels do not act, and a derangement exists throughout the body. The mind and the appetite being now made uncomfortable in their respective stations, consent to call a council, to discuss the various causes of their troubles; and for the first time call in the aid of reason, the digestion, and the other members of the council.

The mind first breaks silence by saying, that for some time past it has not found that degree of *quietness* and *serenity* that it has hitherto been accustomed to enjoy; that in performing its daily business there has

been a degree of *indecision* and *forgetfulness* that was unaccountable; that the space set apart for its exercise seems contracted, and there appears so great an intrusion upon its natural rights that it could not be tolerated any longer. This council, therefore, has been brought together that we may learn the cause and correct the evil if possible.

Yes, says the Taste, my territory has been invaded in the same way as that of the mind. I can no longer enjoy my food as I could once. That pleasure which I was accustomed to take over my roast beef, turkies, ducks, ham, and my game dishes, are not, alas! what they were once to me. My champaigne and other wines, do not open with that delicious fragrance and flavor with which they have heretofore done.

Yes, responds Mind, my rest has also become deficient, and what I have is much disturbed by frightful orgies, so that sleep is rendered rather a curse than a blessing.

Well, says Reason, I thought my two brethren would be brought up on a lee shore all standing, before long, and would be willing to consult the rest of the cabinet, after they had run riot as long as they could stand it. I must confess that I have been a great sufferer in this business. At times I could hardly perform my daily avocations, so affected has my judgment been in consequence of the imprudent management of our brethren, Mind and Taste. Digestion has frequently complained to me of the injustice he had suffered and was still subject to from your imprudent and dissipated habits, as the burden he labors under seriously effects us all.

That is a fact, says Digestion: Now to satisfy you on that point just walk into your laboratory and depository, of which you have appointed me the keeper and chief engineer, and see how you think I can work and do you all justice. [*Opens the door into the depository first.*] Now gentlemen, Mind and Taste have continued to throw a great mass of material into the depository for me to dispose of, for a long time past, both day and night. When I was young and vigorous I did not mind it so much, as I could clear it away by working over hours or doing two days work in one, or working both night and day without rest. This I have done until I can do it no longer for the want of my proper rest; and I even fell asleep at my work last night; and see how my work has since accumulated. It is impossible for me to dispose of the whole of this excess quantity in the laboratory in the time that is required—the consequence is that it will spoil. I can consume more material in twelve hours, and to greater satisfaction and profit to myself and you, brethren, when it is brought in to me at suitable times and in quality and quantity, than I can now in twenty-four hours, to be crowded in this way. Do you not know, Taste and Mind, that if you crowd your stove so full of wood that there is no room for the workmen to exercise or the air to circulate through the interstices or chinks, that it will not burn, and that the smoke is crowded back into the room, to the great annoyance of the whole family? You must know this fact. Do you not also know, that by taking out one half of the wood, and giving room for the workmen to operate or the air to circulate, that the fire will burn lively, the room become warm, the smoke will be expelled, to the great satisfaction of the inmates, the ladies in particular? By this process you see that half a stove full of fuel make the inmates cheerful and happy, while a full stove make them as miserable as smoke and the want of fire could possibly cause them to be. In the first instance every body in the room suffers, because Mind acted without consulting Judgment. In the latter case all are made happy by Mind and Judgment acting in concert, and allowing the workmen time to rest between spells in supplying the stove, while the heat generated from the fuel subsides to that point where Mind and Judgment think it should again be replenished. Do you not know, my brother

Taste, that you furnished me sufficient work last night, when I should have been at rest, to employ me twelve if not twenty-four hours, to dispose of? The consequence is the store house is full, the workmen are fatigued out, and you must all suffer until we can obtain rest. During which time we must call in our friend Emeticus or Catharticus to give us a lift and clear the coast once more. In this case we are obliged to employ a new set of hands to work, who are unacquainted in many respects with our laboratory. We do therefore expect when we get at our business again, to find that much bad work has been done by these strangers. But even in this case, it is better than for the work to cease entirely, for my friends here must be furnished with some kind of support, either good or bad. Now Taste and Mind, I will be your faithful servant so long as you counsel with judgment, but when you do not I shall call in my friends here who have assisted me in this case; for I cannot do as I could once when young and vigorous, before you broke my constitution by requiring me to labor both night and day, and without rest; and by which means I have been rendered in a great measure incompetent to perform my duties, without artificial assistance.

Feet and Hands said they had suffered, but did not know the cause.

The whole body politic assembled in council concurred in the opinion that at times they stood in need of support, but could not account for its absence.

Those inhabiting the region of the bowels complained that the various avenues of the body were clogged, and for a long time the superintendent had not furnished the necessary means to keep them cleansed and in order. The consequence was the bloodvessels were so crowded that the blood was forced to the head or upper part of the body, where there was more space for a free circulation; consequently the extremities were left to suffer with the cold, and for the want of support.

The reason why Mind and Taste found themselves so discommoded, was the intrusion upon their territory by the blood of their neighbors of the lower extremities, which ceased to fulfil its ordinary duties, in consequence of the confusion brought about by their own bad management in not consulting Judgment in relation to food, drink. rest, and such other matters as were calculated to make the body and mind happy.

A PHILOSOPHICAL AND USEFUL OPERATION.

TRANSFUSION OF BLOOD TO SUSTAIN LIFE.

The operation of transfusion, or blood taken from a man and injected into the veins of a woman, who was dying of hemorrhage, was performed under the direction of Dr. Blundell, lecturer on physiology and midwifery, at Guy's Hospital, London.

A poor woman, about 25 years of age, was attended, whilst in labor, by Mr. Waller of Aldersgate street. Nothing particular occurred during the labor, but after the birth of the child, flooding occurred to an alarming extent. When visited by Mr. Waller, the patient's pulse, at the wrist, was scarely perceptible; indeed, at times, it could not be felt; the lips and face were of a pallid or death like hue, and in a word, the taper of life was but faintly glimmering.

Under these circumstances, it occurred to Mr. Waller that the operation of transfusion would be a measure to rescue the patient from her perilous situation.

Mr. Blundell was sent for, and upon his arrival he found the patient had somewhat rallied; in consequence of which he deemed it better to

delay the performance of the operation, for, as Dr. Blundell observed to his pupils, this operation is justifiable in extreme and otherwise desperate cases. After waiting an hour the patient became worse ; she vomited, and was exceedingly restless, which may always be regarded as a very bad symptom; the pulse at the wrist was fluttering, and occasionally not to be felt, and there was that peculiar expression of countenance which can hardly be described ; it may be called 'death in the face.' It did not appear proper to delay the operation, which was therefore commenced as follows:

The cephalic vein of the right arm was laid bare to the extent of about an inch, and a blunt pointed bent needle was passed under the vein, at the lower part of the opening, so as to prevent the efflux of blood. The husband of the patient, a robust healthy young man, was now called in and two ounces of blood was taken in full stream, from his arm, and received into a conical glass tumbler. An opening of about one-eighth of an inch was made in the vein of the patient, and by means of a syringe and tube, the blood abstracted from the husband was somewhat slowly thrown in, towards the heart. No very obvious effects were produced from this supply of vital fluid, and after a pause of one or two minutes, two other ounces of blood were thrown in; soon after this the pulse at the wrist intermitted, and there was slight restlessness, or rather desire to change posture, but these symptoms passed away in the space of two or three minutes. In consequence of the recurrence of these symptoms it was deemed prudent to wait awhile, and after a lapse of five or ten minutes the patient was evidently rallying.

From this period the patient went on improving and had not a single bad symptom which could be attributable to the operation; the functions of respiration, circulation, and of the chylopœtic viscera, were duly performed; the temperature of the surface of the body was of the natural standard, neither was there any subsequent affection of the sensorium; which Dr. Blundell has known to occur in some cases, after the operation of transfusion.

The syringe employed was of brass, and well tinned on the inside; to the mouth of the syringe a pipe was fixed, of about two inches in length, of the size of a crow's quill, shaped like a pen at the end, but with a blunt point.

Before the blood was thrown into the vein of the patient, all air was carefully expelled from the syringe, by placing the mouth upwards, and pushing up the piston until the blood appeared at the end of the tube attached to the syringe.

Dr. Blundell observed, this case demonstrated, beyond all cavil, that the blood of a man may be injected, by means of a syringe, into the veins of a woman exceedingly reduced from hæmorrhage, without causing death. Whether the syncope which occurred after the injection of the blood, was the result of the operation, or of the previous hæmorrhage, may be disputed ; and admitting the syncope to be the result of transfusion, we should be no more justified in rejecting the operation on this account, than in refusing to employ the lancet in other cases, because it occasionally produces syncope.

As only four ounces of blood were injected, Dr. Blundell admitted, that it might be fairly questioned by some, whether the supply of so small a quantity of blood really saved the patient. The doctor, however, (and he had seen a great deal of hæmorrhage,) is decidedly of opinion, that this timely supply of vital fluid turned the scale in the patient's favor, and rescued her from death.

This case was related by Dr. Blundell in one of his lectures.

N. B. We think this treatment philosophical, and is well calculated

to restore patients after excessive hæmorrhage, either from the uterus, lungs, or any other way that blood can be lost from the body. J. T.

SHEEPS' PELT USEFUL IN BRUISES.

In 1808, Marshal Lannes joined the French army in the Peninsula. In crossing the mountains near Mondragon his horse stumbled, and in attempting to rise fell on him. He was carried to Vittoria in a state of great danger from the shock and the pressure.

Treatment.—A large sheep was immediately flayed, and the reeking skin was sown round the Marshal's body, while his limbs were wrapped in warm flannels, and some cups of weak tea were given him. He felt immediate relief, complaining only of the manner in which the skin seemed to attract every part wherewith it was in contact. In the course of ten minutes he was asleep. When he awoke the body was streaming with perspiration. The dangerous symptoms were relieved; and on the fifth day he was able to command at the celebrated battle of Tudela,* in which 40,000 men under Castanos were beaten and dispersed, with the loss of all their ammunition and baggage.

N. B. There is now living and in health, in this city, (Albany,) a lady who, at the age of eleven years, was crushed under a heavy timber, and whose life was in like manner preserved by the immediate application of a warm pelt hastily stripped from a sheep. J. T.

INDIAN REMEDY AND CURE FOR CONSUMPTION.

We copy the following interesting cure from the travels and adventures of Ross Cox, upon the Columbia river, and among the western tribes of Indians.

"The Oakinagan mode of curing some of our diseases would probably startle many of the faculty. The following case in particular passed under my own observation:

One of the proprietors had, in the year 1814, taken as a wife a young and beautiful girl, whose father had been one of the early partners, and whose mother was a half breed (her grandmother having been a native of the Cree tribe;) so that although not a pure white, she was fairer than many who are so called in Europe. He proceeded with her to Fort George: but the change of climate, from the dry and healthy plains of Fort des Prairie to the gloomy forests and incessant rains on the north-west coast, was too much for her delicate frame, and she fell into a deep consumption. As a last resourse, her husband determined to send her to Oakinagan to try the change of air, and requested me to procure her accommodation at that place for the summer. This I easily managed. She was accompanied by a younger sister, and an old female attendant.

For some days after her arrival we were in hourly expectation of her death. Her legs and feet were much swollen, and so hard that the greatest pressure created no sensation: her hair had fallen off in such quantities as nearly to cause baldness; a sable shade surrounded her deeply sunk eyes. She was in fact little more than a skeleton, with scarcely any symptoms of vitality, and her whole appearance betokened approaching dissolution. Such was the state of the unfortunate patient, when an old Indian who had for some days observed her sitting in the

* Memoirs de Larrey, tom. iii. p. 243. That eminent Surgeon had learned the remedy from the Savages of Newfoundland, who had applied it to some sailors whose boat had been broken to pieces and themselves dashed by the waves upon their coast

porch door, where she was brought supported on pillows to enjoy the fresh air, called me aside, and told me he had no doubt of being able to cure her, provided I should agree to his plan; but added that he would not give any explanation of the means he intended to use, for fear we might laugh at him, unless we consented to adopt them. We accordingly held a consultation, the result of which was, that the Indian should be allowed to follow his own method. It could not make her worse, and there was a possibilily of success.

Treatment.—Having acquainted him with her acquiescence, he immediately commenced operations by seizing an ill-looking, snarling, cur dog which he half strangled; after which he deliberately cut its throat. He then ripped open the belly, and placed the legs and feet of the patient inside, surrounded by the warm intestines, in which position he kept them until the carcass became cold. He then took them out and bandaged them with warm flannel which he said was very good. The following day another dog lost its life, and a similar operation was performed. This was continued for some time, until every ill-disposed cur in the village had disappeared by the throat-cutting knife of our dog-destroying doctor, and we were obliged to purchase some of a superior breed. While she was undergoing this process she took, in addition a small quantity of bark daily in a glass of port wine. In the mean time the swelling gradually decreased, the fingers lost their corpse-like nakedness, the hectic flushes became rarer, and "that most pure spirit of sense," the eye, gave evident tokens of returning animation. When her strength permitted, she was placed on the carriage of a brass field piece, supported by bolsters, and drawn occasionally a mile or two over the prairie. The Indian continued at intervals to repeat the strange application, until the swelling had entirely disappeared, and enabled her once more to make use of her limbs.

Two-and-thirty dogs lost their lives in bringing about this extraordinary recovery, and among them might truly be numbered

> Mongrel, puppy, whelp and hound,
> And curs of low degree.

She gradually regained possession of her appetite; and when her husband arrived in the autumn from Fort George, for the purpose of crossing the mountains, she was strong enough to accompany him. The following summer, on my journey across the continent, I met them at Lac la Pluie.—She was in the full enjoyment of health, and 'in the way that ladies like to be who love their lords.'"

Remarks.—It will be observed that the philosophical theory of Thomsonism was carried out in the above case in replenishing and sustaining vitality by receiving animal warmth and support by absorption from the bodies of animals through the medium of the feet. This case will furnish a useful study for all practitioners. Where the Thomsonian remedies could not be obtained and it should be thought advisable to try a similar experiment, sheep would be a good substitute for the dogs. We think the experiment worthy of notice and trial. It shows the truth and philosophy of our theory. J. T.

REUNION OF FLESH AFTER COMPLETE SEPARATION.

The Ossevatore Medico contains a curious, and what it affirms to be a well authenticated case of reunion of the nose, after complete separation. The patient, a woman of the town, had the whole of the soft part

of the nose bitten off in a quarrel, by a man. She was immediately carried before the commissary of police, when the nose was dressed. In three hours afterwards, Dr. Carlizze, who happened to come in, saw the patient, and entreated that search might be made for the lost nose. This was done, and two and a half hours afterwards, the mutilated portion was found, contracted, and all covered with filth. The Doctor, however, washed the parts clean, and applied the piece, putting in a few points of suture. The dressings were not removed before the seventh day, when the witnesses observed, with great satisfaction, that complete reunion had taken place. In thirty-seven days, the cocatrix was perfectly consolidated. The aspect of the nose, however, was most disagreeable, from the color of its tip, which presented a livid, unhealthy appearance. A solution of nitrate of silver (moderately strong) was applied to this part, and after the fall of the eschar, in five days, the nose resumed its natural color.

CRIME IN FRANCE.

A French periodical, the "Revue Encyclopedique," contains the following curious facts relating to crime in France :

"Out of every 100 persons accused, 61 are regularly condemned. Out of the whole population, 1 in every 4,460 is accused. In every 100 crimes, 25 are against the person, and seventy-five against property. Experience shows that the number of murders is annually nearly the same ; and what is still more singular, that the instruments or means employed, are also in the same proportion. The inclination to crime is at its maximum in man at about the age of 25; in woman 5 years later The proportion of men and women accused is 4 to 1.

The *seasons* have an influence on crime. In summer more crimes are committed against the person, fewer against property ; the reverse is the case in winter. The developement of the inclination to crime agrees very perfectly with that of the passions and physical strength ; and on the other hand the development of reason tends to restrain the inclination. The greatest physical strength of man is developed between the ages of 30 and 35, and the greatest mental powers between the ages of 45 and 50. It is a singular contrast, that about this age, we find mental alienation the most frequent, and most difficult to remove."

THOMSONIAN PRACTICE.—LOSS OF BLOOD.

Among the many casualties to which mankind are subject, and one more to be dreaded than any other, is the excessive loss of blood. When an artery or vein is severed upon either of the limbs of the body, so that the stream of life is rapidly flowing, and the vital spark fast extinguishing, which is frequently the case with the hardy yeomanry of our country, who are accustomed to the use of implements of husbandry which wear keen edges, a speedy and effectual remedy, that would check the crimson current, must certainly be invaluable to them.

Perhaps it will be regarded almost fabulous, if we say to those who are liable to cuts or incised wounds, that the blood may be stopped with the greatest ease by the following method:

If the wound should be upon the foot, and the arteries are cut ever so bad, or if you please if the foot is severed entirely from the leg, by lying down upon the back and placing the wound above the head, the blood will immediately cease to flow from the wound. Some may doubt this

statement, but it is a fact. The writer of this article has had the blood stopped in several instances upon himself by this means.

If the wound is upon the foot, the person should lie down upon his back and place the foot higher than the head, upon a stool or chair; and if it be upon the hand or arm, put the wound above the head, and the blood cannot run, any more than water can run from its fountain while the stream is raised above it. In order to satisfy the incredulous upon this subject, we would request them to try the following experiment. When the veins in the hands are full, and appear to be crowded, which is perceptible to any person who can discover any object by the power of vision, place the hand in a perpendicular position above the head, keeping an eye upon the veins, and in less than one minute the blood will have descended into the trunk of the body, and the veins disappeared.

When a person has received an injury in any of the limbs, and a resort to this experiment is necessary to stop bleeding, let the wound be well washed with cold water, and then a small quantity of No. 6, or third preparation, be poured upon it, dress it in that situation before it is removed from the elevated position, and the bleeding will instantly stop. But should the wound be very bad, the limb should be kept in that position from three to six hours, or until the wound has become a little closed or dried at the orifice. J. T.

EXERCISE.

A certain proportion of exercise is not much less essential to a healthy or vigorous constitution, than drink, food and sleep; for we see that people whose inclination, situation, or employment, does not admit of exercise, soon become pale, feeble, and disordered.

Exercise promotes the circulation of the blood, assists digestion, and encourages perspiration; all of which are in a degree necessary to a hale constitution.

It may be divided into two species, active and passive. Of the former kind are walking, running, leaping, swimming, and riding on horseback: of the latter are sailing, swinging, friction, riding in carriages, &c.

There is one species of passive exercise which deserves to be particularly mentioned and recommended, more especially as it often becomes necessary, and is peculiarly adapted to the aged and infirm, and such as cannot partake of any of the active kinds: I mean friction; which, performed either with the naked hands, flannels, or flesh-brushes, may not only be of essential service to those of that description, but, by promoting perspiration and the circulation of the blood, it often becomes useful in arthritic, rheumatic, and paralytic disorders. This appears to have been in much more common use, both as a preventive and remedy, among the ancients and moderns; the former of whom called it chafing.

The effects of the want of exercise are more apparent and destructive, when conjoined with high living and strong drink: hence the gout and many other diseases are generated; indeed so evidently so, that it is now become almost an established fact, that that disorder will never appear, where sufficient exercise, with abstinence from animal food and wine, is practised.

It is a fact which long experience has taught, that idleness and luxury create more diseases than labor and industry; which shows that an indolent and inactive, as well as an over-delicate and refined mode of life, is inimical to health and longevity; hence the greater number of disorders in cities, where the inhabitants live high and use but little exercise, than in country places, where they labor more and live more sparingly.

PERSPIRATION.

Kell, by a very accurate set of experiments, ascertained that in his own person he perspired thirty ounces in twenty-four hours. Hales, by experiments equally accurate, found that a sunflower, of the weight of three pounds only, throws off twenty-two ounces, or nearly half its own weight, in the same period of time.

But what is *perspiration*? Plain as the answer to the question may be to a portion of the community, by many it is not understood at all. Some attach no definite idea to the term. Others seeing the word experiment, and several figures in the same connection, conclude at once that it is a something tedious or difficult, or perhaps beyond their comprehension, and pass it over. Others still have no idea that a person perspires at all, except when that profuse discharge takes place from the vessels, commonly known by the name of sweating.

Now sweating is only an increased and profuse discharge from the vessels at the surface of the skin, of the same fluid which is passing off, so long as we are in health, at every moment of our lives. If we sit near a white wall in a hot summer's day, while the sun is shining on us and the wall, we may see the shadows of masses of vapor ascending like smoke on the wall. Or take a looking-glass and hold it within an inch of the body or limbs of a person. and you will soon find it dimmed by a moisture. That this effect is not produced by our breathing is plain, because if we hold our breath, or place the mirror opposite our back, the same result follows.

The truth is, that every square inch of the surface of the human body, except perhaps the eye-balls, nails, &c. has in it thousands (probably tens of thousands) of small holes or pores, from which, so long as we are in health, a vapor, more or less abundant, according to circumstances, is constantly issuing. To check this moisture, let it be done by what means it may, and let it remain checked for a considerable time, produces mischief. Sometimes the evil appears in the form that we call colds; at other times it produces rheumatism, fevers, and consumption. To increase it very greatly for a considerable time, so that a person is said to sweat profusely, unless done for the purpose of removing disease which already exists, is also injurious in the end.

But perspiration may be checked or rendered profuse in a great many ways. We do not believe all adults ought to perspire as much in twenty-four hours as Kell says he did. Still they ought to perspire at all times, and in considerable quantity; and whether the pores of the skin are stopped by dirt, or by uncleanly garments, or by great cold or heat, or by sudden chills, the consequence in time may be equally dreadful.

DROWNING.

The following judicious rules were drawn up by Mr. D. O. Edwards, of Chelsea, who turned his attention to the subject from having recently witnessed the drowning of three men in consequence of their own misdirected exertions. His belief is that a majority of the deaths of this kind arise from the same cause.

Rules to govern persons who have fallen into deep water.

1. As soon as you find yourself at the surface of the water, whither you are raised by your buoyancy, let your body quietly take its level, when the water will reach a little above your chin.

2. Place one leg a little forward and the other a little backward, and stretch out your arms on either side, keeping them under the water. By

a slight paddling motion you may regulate the position of the head, and prevent it from gravitating downwards. Make no efforts, but wait tranquilly until succor arrives. *You cannot sink.*

3. Do not lay hold of your companion or assistant, or you will infallibly sink him, without benefitting yourself. The best swimmer has no more natural buoyancy than yourself, and would be sunk by the exertion of a very little force.

4. Be perfectly passive until your helper seize you by the hind locks of your hair. Upon this endeavor to second his efforts by throwing yourself on your back. Hold your neck stiff, and let your hind head sink into the water; then try to propel yourself, by slowly and regularly kicking against the water.

5. Be careful to keep every part of your body under water, except your face.

6. If two or more persons are immersed together, let them keep near each other. By this arrangement, one boat may save the whole party at once; but if they are dispersed, one at a time only can be picked up.

Rules to govern persons who attempt to rescue the drowning.

1. In removing a body from the water, whether into a boat or drawing it along by your own efforts, always keep the face upwards.

2. Recollect that you have no more natural buoyancy than the person you are attempting to rescue; therefore do not attempt to raise him out of the water, or you will sink yourself. By a gentle traction you may draw him towards the boat or the landing place, without fatiguing yourself.

3. Always aim at seizing the hair of the hind head, and keep the nape of the neck and your own hand under water; thus you insure his face and your own above the surface.

4. Keep your most powerful arm disengaged for swimming, and keep the other projected forward, having hold, as already directed, of the hair of his hind head. In this way you may advance side by side, he floating supine on his back, and you prone on your breast.

5. As you approach the persons immersed, let them know by a shout: the voice reverberates with double distinctness from the surface of the water, and the prospect of approaching aid adds to the confidence and consequently to the strength of the distressed.

6. Let all your movements be deliberate, firm, and gentle.

With a view to remove apprehensions about the weight of wet clothes upon a person immersed in water, Mr. Edwards says:

To ascertain the increase of weight which clothing adds to the body in water, I made an experiment. I tied up into a bundle a complete suit of raiment, consisting of a cloth surtout, a waistcoat and trowsers, a linen shirt, a pair of cotton drawers, a pair of cotton stockings, and a pair of Wellington boots. The weight of the bundle when dry was seven pounds. It was kept immersed in water, and under a heavy weight, for an hour, until every particle of air was expelled from the interstices. It weighed in the water just one pound. Immediately after being taken out of the wator it weighed twenty.one pounds.

The calculations are intended, and when tested by personal experiment ought to imbue the mind of every man, with the conviction—the firm confident conviction—that he is naturally buoyant in the water. For deducting the effects of fear and the weight of clothing from the fifteen pounds of sustaining levity belonging to the body *per se*, the remainder would be eleven pounds eight ounces, which is quite enough to prevent the immersion of the breathing appertures, that is, the mouth and nostrils.

VALUABLE DISCOVERY.—RESUSCITATION OF THE DROWNED,

Recent extraordinary effects of Galvanism in Restoring Life, apparently extinct.

The following are a series of very interesting experiments, made by a gentleman named Halse, of Brent, near Ashburton, England, to test the power of galvanism in cases of suspended animation from drowning.

"On Thursday last one of my spaniels whelped, having a litter of thirteen, six of which I took for my experiments. I drowned three of them in cold water and kept them immersed for fifteen minutes, at which time I took them from the bucket and placed them in front of a good fire. No motion could be perceived in either of them. I then put the front legs of one of them into a jar containing a warm solution of salt and water, and its hind legs in a similar jar, in each of which was inserted one pole of the galvanic battery; the whole were then placed near the fire.

"The position of the dog being now favorable to operate upon, without the necessity of making any incisions in the flesh, I passed a very strong shock through its body; it moved its hind legs. I gave it another shock, which caused its tail also to move. I now passed twenty shocks in quick succession through its body; it moved every limb, its mouth opened, and I was inclined to believe that the dog had actually come to life; but the moment I ceased passing the shocks the dog was as motionless as it was previous to my commencement. Again I continued the shocks, and noticed that there was more motion in the limbs. Considering that in proportion to the return of sensibility these shocks would be too powerful for it, I decreased the intensity of them, and passed many hundreds in rapid succession. I continued this for about five minutes, the motion of the limbs increasing as the shocks increased in number. I now ceased; the dog still moved; *it was restored to life.* I placed it on a warm flannel in front of the fire, and in a short time it appeared as well as it was previous to its being drowned; it crawled on the flannel, and made the noise peculiar to young dogs.

"I now examined the two other dogs, which were drowned and taken from the water at the same time this one was. They were both dead—a plain proof that it was entirely owing to the galvanic fluid that life was restored.

The other three dogs I drowned in warm water and kept them immersed for forty minutes, at which time all motion had ceased. Two of them I laid in front of the fire, and the remaining one I placed in the jars as in the preceding experiment. I now passed a few shocks of weak intensity through the body, but no motion was perceptible. I therefore increased the intensity of them considerably, and gave the shocks in quick succession. Every limb moved, the belly protracted and again collapsed, and the head was raised. At this period I stopped passing the shocks, in order to see if there was any motion in the dog when not under the galvanic influence: there was none. I again proceeded with the shocks, and noticed that the limbs moved more rapidly than before. I considered it necessary to decrease the intensity and increase the quantity of electric fluid, which I did, so much as to be enabled to perceive a slight tremor in the dog. I continued in this manner for about five minutes, at which time I removed it from the jars and placed it on the table. *It was alive.* In a quarter of an hour it appeared to be perfectly recovered.

"The other two dogs (which were not allowed to get cold during the whole of the experiment) were now examined; no motion whatever could be perceived. I tried the effect of galvanism on one of these, and was successful. In one hour after this I operated on the other dog also,

but it was in vain. There was no vigor remaining in the vital powers; life had fled."

REMARKS.

It will be perceived that the treatment of the dogs above mentioned was strictly Thomsonian. The immersion of the feet in warm water, to increase vitality by absorption, is agreeable to our theory; and the use of galvanism to effect an oscillation of the lungs, appears to be an improvement. A warm stimulating injection with a human being, we think would also be an improvement, in connection with the applicatian of hot water to the feet, to increase the vitality or warmth more rapidly to that degree or point so necessary for respiration, in order to facilitate the process of breathing as soon as the lungs could be brought into action by the application of galvanism.

In the case of a drowned person, the patient should be laid upon a bed, his body shielded with flannel, his head and shoulders gently elevated, and his feet over the foot of the bed, immersed in a pail of water, as hot as can be borne by the attendant. Then apply your remedies as rapidly as judgment may dictate.

This is similar to the engineer raising a head of steam sufficient to operate the machine as soon as the valves are raised by artificial power to let the steam in upon the machinery.

We think this subject should be investigated by all Thomsonian practitioners. J. T.

TO NERVOUS PEOPLE.

UNREASONABLE FEAR OF THUNDER.

A young man who for some years was so terrified by thunder and lightning as to be upon the point of falling into fits at their approach, found very great benefit from the following reflections, which a friend sent him for his most serious and frequent consideration.

To diminish these ungrounded apprehensions, the timid should be informed, that of 750,000 persons who have died in London within a space of thirty years, two only fell victims to lightning. They should also be informed, that they unreasonably prolong their fears at each shock. He who has time to dread the consequences of a flash of lightning, is already out of its reach.

It is the lightning alone that can hurt us; and if we have seen it, it is folly to grow pale, and tremble by the clap of thunder, and to stop our ears against the noise which announces all danger to be past.

The greater the interval between the thunder and the lightning, the more removed is the danger.

If with our finger to the pulse we can count in the time twelve or thirteen pulsations, we calculate the storm must be three miles distant. But the very best preventive against this or any other alarm, is the testimony of a good conscience.

DIMINUTION OF ANIMAL HEAT IN SLEEP.

During sleep, or during the hours in which sleep usually takes place, the temperature of the body falls one degree, according to Magendie. The cause of this decrease of heat is to be sought in the languid state of the body at the time, all the vital actions being carried on more feebly, owing to the abstraction of exciting agents and the exhaustion consequent on the exercise of the day.

Of Wounds and Contusions.

A contusion or bruise is a wound internally, and does not communicate with the external air. Though some bruised parts are not attended with the tearing or lacerating of the flesh, yet the flesh assumes the appearance of *black* and *blue*, showing that the capillary vessels are really injured or ruptured, for which reason the two are classed together.

WOUNDS MADE BY INCISION,

Or sharp instruments, attended with a copious flow of blood, demand immediate attention. The venous and arterial blood are easily distinguished from each other—the venous blood by its dark red color, and that of the arteries from its bright scarlet appearance. The former flows in a steady stream, while the latter is thrown out by the cardial action, with which corresponds the vibration of the pulse, ejecting the blood many feet when a large artery is severed. When the arteries are very small the vibration of the pulse is scarcely perceptible in the stream or flow from the wound; hence many times it is difficult to determine whether an artery is incised or not.

MEDICAL TREATMENT.

In all cases the wound should be bathed in moderately cold water, and thoroughly cleansed from dirt and coagula, if there be any within the lips or orifice, until the peculiar aching or smarting sensation is entirely gone. Then wipe the part dry, and bathe the internal and external surfaces of the sore with No. 6, or rheumatic drops. Let the lips be pinched together with the thumb and fore finger, and then put a narrow bandage close about the sore, and make it fast. Should the wound be on the arm, hand, leg, or foot, and bleed freely, let the person put himself in such a position as to raise the wound above the head, and the bleeding will stop instantly, when it should be dressed in that position. After the first dressing there will be but very little inflammation or pain in the sore. In the course of six or twelve hours the bandage may be taken off, and the the lips of the wound will be closely dried or adhered together. Now wash in soap suds and dry off with a cloth, then apply a plaster of yellow salve, and the sore will rapidly heal. Should the patient feel faint under the first dressing, or at any time after the accident, give a teaspoonful of the drops, or a dose of the prepared composition powders. In all cases the bowels should be kept in good order, with a natural flow of the perspirable matter to the surface.

TAKING UP AN ARTERY.

When the bleeding is profuse, it may be necessary to take up an artery. If on separating the lips of the wound the artery is in sight, it may be seized with a small pair of pincers, or a small hook, and tied with a ligature composed of two or three threads of silk, well twisted and waxed. The arteries are known from the current of blood ejected by every pulsation of the heart. Great care should always be observed while taking up the artery, that none of the small nerves are included, which are always found near the arteries.

TO STOP BLOOD IN ANY OF THE LIMBS.

If a person has wounded himself ever so severely in any of the limbs, either arms or legs, and he puts himself in a position to place the parts wounded above his head, the blood will cease flowing in an instant; the same as a stream by being raised above the fountain will flow back to it again. In that position, the limb may be bathed with cold water and cleansed, as before described, taking up the arteries if necessary; after which bathe with drops and bandage the orifice together, and in a few hours the lips will be dried or attached to each other. There will be but little pain or inflammation. Then wash with soap suds, dry with a cloth, and apply the salve.

Where the wound is very serious, it may be necessary to keep the injured limb above the head most of the time for several days, only taking it down occasionally for a few minutes, that a small quantity of the blood may circulate through it, thereby keeping the activity and warmth in it, but not to such an extent as to re-open the blood vessels that have been closed by adhesion by the above treatment.

WOUNDING THE PRINCIPAL ARTERIES

Or blood vessels of the arm, thigh, or neck, is attended with fatal consequences, unless a tournequet or some other instrument for stopping the circulation of the blood can be applied to the part. In some cases, by applying to the wound after compressing the lips together, several thicknesses of cotton or tow batting, and then tie a towel or handkerchief about the limb as close to the body as possible, and slip through the loop a toggel and twist it up until the blood vessels are so completely compressed as to stop the bleeding, and measurably the emission of blood into the limb. By this means the blood may be stopped for the time; but it will eventually destroy the warmth and activity of the limb if persisted in for any great length of time.

THE TOURNEQUET,

Is an instrument calculated to apply to and tighten a ligature about a limb near the body, in such a way as to compress all the blood vessels and arrest bleeding completely.

The tournequet is employed by surgeons to prevent hemorrhage while amputating a limb, and must in all cases be put between the wound and the body. The instruments used by surgeons are too expensive for family use; but the field tournequet, consisting of a single strap, with a pad adapted to the purpose, and a buckle—such as are kept for field service in the army, and are sold in the shops—are of a cheap construction, and may be kept for use in families.

STITCHING WOUNDS.

It is very seldom that wounds require to be stitched, except on the eyelids, nose, lips or ears, where adhesive plasters will not keep the lips of the wound together. It occasionally happens that a wound is made several inches in length. The stitches should be in the various angles, and in such parts as the judgment may dictate as best calculated to bring the lips of the wound closely together, to good advantage. Strips of the sticking plaster applied between the stitches to bring the parts more closely together, may be used with propriety.

TO PREPARE STITCHING THREAD.

Take according to the size of the wound, one, two, or three threads of sewing silk, (the white is best) about six inches in length, well waxed;

place the thread through the eye of a darning needle, if there be no surgeon's needle at hand; pass the needle through from within the lips of the wound under the skin, and have it pass up through the skin about half an inch back of the edge of the orifice, being particular to include the full thickness of the skin, which is from an eighth to a quarter of an inch, in the different parts. Draw through the ligature, until the middle of the thread rests in the middle of the wound; then detach the needle, and thread it with the other end of the silk; then commence in the wound below the skin and bring it out in the same manner on the opposite side. The stitch being complete, the tying of the ends of the ligature in a single or sliding knot completes the work. The second or third stitch may be taken in like manner, if necessary.

THE STITCHES

Should never be tighter than barely sufficient to cause the edges of the wound to touch each other gently. The strips of sticking plaster and the bandage should take off from the rest of the wound all pressure or excessive confinement of the sore. If the parts become swelled or inflamed, the stiches should be cut immediately; or as the parts adhere together so as not to need them, the thread may be cut and drawn out.

OF CONTUSIONS, OR SPRAINED JOINTS.

In every sprain that is severe, there exists an internal wound, more or less extensive; hence we frequently find the joints weak after the swelling is gone. In such cases, the ligaments of the joint are more or less lacerated, or violently distended. Ligaments that have had their elasticity overdone, recover their tone very slowly; consequently the joint remains weak for a long time, and frequently requires artificial support for its protection.

THE TREATMENT OF SPRAINS.

The relief of the violent pain produced by the overstretching or twisting of the ligament, and the abatement of inflammation, is the first thing to be attended to.

Take some hot drops or composition, to prevent fainting, then put the foot or joint injured into as hot water as the patient can bear; rub it thoroughly while in the water, increase the heat if necessary, and in ten or fifteen minutes take it out, wipe it dry, and bathe with stimulating liniment or hot drops; then bandage it well with flannel, in such form as to support or brace the joint; then let the patient go to bed, put a hot brick or stone at the feet, get them into a perspiration, and in a short time the pain will subside, if the limb is kept still.

Should the inflammation remain high, a poultice of brewer's yeast, placed completely around the joint and kept moist, will ease the pain almost immediately. Or a bread and milk poultice is good. Wormwood and vinegar may be used, if neither of the above remedies can be had. Or a fresh skin from the back of a sheep or other animal, applied to the sprain when it is warm from the animal, is attended with the happiest results, as it will cause the part to perspire freely, and ease the pain.

If the sprain is very bad, and the inflammation continues to progress towards the body, an emetic or a course of medicine should be taken, which will most generally arrest its progress, and force the swelling back to the part affected, where it is abated by the poultices and fomentations, provided the patient is kept in a profuse perspiration throughout the body.

THOMSONIAN THEORY,
OR UNIT OF DISEASE.

Dr. Thomson's principles of disease are, that all complaints originate, directly or indirectly, from the same cause. That cause produces derangement of the fluids of the body, and that form of disease for which the body appears best adapted. The taking of cold, or loss of vitality from indigestion, over eating or drinking, or any other derangement of the functions of the body, are the causes which create an inability to throw an active and healthy circulation to the lower extremities, in such quantity and quality as is necessary to carry on perspiration and a free and easy circulation throughout the system.

Vitality being thus reduced, is not capable of keeping the feet from being cold from absence of heat, which in turn contracts the blood vessels in the lower extremities, and forces the quantity of blood that is necessary for their support to the head, the side, upon the lungs, or to that part of the system best adapted for the purpose; thus the head, or the part upon which the cold or disease settles, has not only the requisite quantity of circulation, but that of the feet also, which creates distress, in consequence of the over distention of the vessels, and disease is the result.

The name of the disease is derived from the part where the greatest distress, pressure, or distention of the blood vessels has been experienced, for the want of a suitable circulation in the feet; thus affording relief to those parts that have experienced the shock by full blood vessels in the feet. If the cold settles upon the lungs, it is consumption, or inflammation of the lungs; if in the side, pleurisy; if in the head, head-ache; if in the bowels, cholic; if in the limbs, rheumatism; or if thrown to the surface generally, fever.

After all, these different forms and names of disease arose from the same cause—the derangement in consequence of taking cold, or the loss of a portion of vitality.

And they may all be removed, by restoring an equilibrium of the fluids through the body, and giving to every department its due proportion of warmth and perspiration. Remove the debility consequent upon the derangement or absence of heat, and the system assumes once more a healthy action. Each member then becomes obedient to the power that commands in that particular department; and order and regularity assume their appropriate control throughout the body. J. T.

DISEASE.

The different names which the unnatural concentration of the fluids of the body have received from their location, will now be treated on, under their appropriate heads and different names.

Eruptive Diseases.

SMALL POX.—*Variola.*

The disease of variola, or small pox, which a century ago was scarcely less dreaded than the plague itself, affords a memorable example of the triumph of the medical art over what appeared to be an inevitable evil

attached to human existence. By the introduction of inoculation, the disease was rendered comparatively safe to the individual; and by the substitution of the vaccine for the variolous poison, this benefit has been extended to the community at large. Some time must be allowed for the prejudices of mankind to subside, but we have every reason to hope that ultimately this destructive scourge will be banished from civilized countries.

According to the degree of violence with which variola exists, it constitutes two varieties, which, although evidently belonging to the same disease, and convertable into each other, differ essentially in their symptoms, and require different modes of treatment. From the peculiar appearances of the eruption, they have obtained the names of *distinct* and *confluent*.

The first attack of small pox is marked by symptoms of general fever, which partake of the inflammatory type, and is characterized by vomiting, and by pain upon pressing the region of the stomach. On the third or fourth day the eruption begins to appear on the face, and in about two days is completely over the body. It appears in the form of small red points, which afterwards rise into pimples, and at length, by the fifth or sixth day, are converted into vesicles, containing a light yellow fluid. These vesicles are surrounded by an inflamed margin, so as to produce a considerable redness over the whole surface of the body which is not actually occupied by the vesicles themselves; and all the soft parts, especially the face, are so much swollen that the eyelids are often completely closed. About the eleventh day the fluids in the pustules become opaque, and of a yollowish color; and being now fully matured, the vesicles burst and shrivel up, and the inflammation gradually subsides, leaving red marks upon the skin, which, when the disease has been violent, are succeeded by pits or depressions, that are never afterwards obliterated. The pustles on the other parts of the body proceed in the same order with those on the face, but go through their successive stages a day or two later, and are generally attended with less inflammation.

In the *distinct* and less violent form of the disease, the fever abates when the eruption is completed, and seldom returns in any considerable degree; but in the confluent variety, what is called the secondary fever comes on at the period of maturation, which is often equally violent, and is indeed more to be dreaded than the first, or the eruptive fever.

All the symptoms of this variety are more urgent, and come on at earlier periods, although at the same distance of time from each other; the pustules are more numerous, so as to run into each other and form patches of continuous suppuration, while at the same time they are less elevated than those in the distinct kind, and have less inflammation around their margin. The fever is also of a different nature, exhibiting more of the typhoid type, and the system in general seems to be more oppressed and torpid, and to be less capable of reaction.

The prognosis of the disease depends very much on the nature of the variety to which it inclines; for while in the distinct small pox we may generally hope for a favorable issue, the confluent is, for the most part, nearly beyond the reach of medicine. What circumstance it is that produces the two varieties we know not; it depends in a great degree upon what may be called the prevailing character of the epidemic; in some the *distinct* and in others the *confluent* being the most frequent; but we are not able to connect these differences in the nature of the epidemic with any external circumstances, or with any peculiar state of the constitution. We have sufficient evidence that it does not depend upon any specific difference, or the nature of the contagious matter, because both the varieties are capable of being produced from the same source of infection.

Small pox is always produced by its own specific contagion; and when once the individual has gone through the disease, in however slight a degree, he is secured from any future attack. Upon this fact is founded the practice of inoculation; for we learn, that when a portion of the matter is inserted under the cuticle it will communicate a much milder disease than one which is received in the usual way, which is probably by the lungs.

We are, however, totally unable to explain the cause of this difference. The relation which the fever bears to the eruption, or the degree in which one is to be regarded as the cause of the other, is a point that has given rise to much speculation. According to the humoral pathology, the eruption was thought to afford a remarkable example of the critical discharge of an offending matter from the system; and proceeding upon this principle, the great object of the practitioner was supposed to be to promote this discharge; a system which led to a practice precisely the reverse of the true one, and which must no doubt have proved highly destructive.

In what way the fever operates, or what is the proximate cause of the disease we know not; but it appears that the eruption is the consequence of the fever, and that whatever diminishes the fever diminishes the eruption also, and at the same time lessens the violence of the disease.

TREATMENT.

The Thomsonian plan of treatment is founded upon the principle, that to diminish the febrile action in the early stages, by keeping the body very temperate, by the use of such medicines as will barely keep the disease from striking in upon the vitals, is all that is necessary. And the patients should be kept in a temperature as low as can be made consistent with their comfort. Perspiration should only be moderately felt in the palms of the hands; but by sweating to excess it will bring out the disease in its most violent forms, spreading and uniting in one vast mass of pustles and matter throughout the surface of the body; and when the crisis takes place, it generally destroys the patient. When if the patient had been kept in a moderate temperature, there would not have been found upon the surface so much perspirable matter to unite with the virus, and thereby augmenting the quantity of poison; but it would have passed off by other means, and relieved the surface in the same proportion. The main thing is to keep down the febrile excitement upon the surface, and in the proportion that this is done, in the same ratio you avoid the pustles.

In the *distinct* variety, all direct attempts to act upon the eruption, except so far as we can subdue the fever, are at least useless, if not positively injurious; and when the disease has run through its course, the powers of the constitution soon return to their accustomed standard.

In the *confluent* small pox we have a much more formidable disease to combat, and one which frequently baffles all endeavors. From its very commencement, it exhibits symptoms much resembling those of typhus fever; the cold air produces a dangerous shock to the oppressed and languid powers of life. The circumstance which renders this variety of the disease so critical is, that when from any cause the eruption suddenly disappears—an effect which sometimes ensues from the sudden application of cold to the surface, or from an injudicious use of purgatives, the vital powers become so suddenly oppressed by the reduction of animal warmth that the virus strikes in, and threatens the extinction of life almost immediately.

When this is the case, we make a more free use of stimulants; but great experience and good judgment are so necessary in a case of this

kind, that it is impossible to give directions, as we could if the patient were before us, as there are many remedies that might be applied in one stage of the disease that would be improper in another. Hence the necessity of a judicious practitioner, who will know how to keep the system in a cool and temperate state, to avoid the excessive eruptive putrefaction upon the surface. For it is much better for the patient, to let the virus remain in the flesh, and work it off moderately by other means, than that it should make its appearance upon the skin, where it becomes subject to the action of the atmosphere, by which the poison is augmented in a ten fold degree, by mingling with the perspirable matter, and the jeopardy of the patient is increased in the same proportion.

The pustules should not be ruptured; but let them come to maturity and separate from the flesh, which is the proper way to avoid the deleterious effects that would otherwise attend the welfare of the patient. The practitioner must bear in mind, that he has to contend on the one hand with the tendency to febrile excitement, and on the other to the state of exhaustion which generally succeeds the former, when it has been violent and long protracted.

There is often in confluent small pox a state of restlessness or extreme agitation, which may be relieved with the nerve powder in a little composition tea or asafetida.

One of the most distressing effects of the confluent small pox is the injury which it leaves to the constitution generally, or to particular organs, of which the eyes are the most apt to suffer, so as not unfrequently to produce the complete loss of sight.

In conclusion.—The small pox is the highest state of canker and putrefaction which the human body is capable of receiving, and is the most contagious, being taken by the breath, or it may be communicated by inoculation, in which case it is not so violent and dangerous as when taken the natural way.

The distressing and often fatal consequences that have happened in cases of this disease, are more owing to the manner in which it has been treated in many instances, than to the disease itself. The fashionable mode of treatment has been, to give physic and reduce the system by dieting, and keeping the patient too cold. A judicious medium should be observed between the extremes of heat and cold, for the habitation of the patient. You do not wish to keep him so hot as to injure him by enlarging the size and increasing the number of the pustules upon the surface by perspiration and endanger the life of the patient by excessive putrefaction outwardly, when exposed to the air; neither do you wish to keep him so cold as to have the disease strike in vitally, and by that means to destroy his life. Therefore keep a moisture gently in the palms of the hands, a moderate temperature upon the surface; keep the bowels regular by a proper diet and without physic; let his exercise be lively, for a few minutes at a time, if able to be out, and when he stops to rest, to sit or stand, let it be where the wind does not blow on him, so as to take cold. If he is not able to be out, have the room well ventilated as often as necessary, and keep him away from the fire, if you would wish to avoid his having a great number of pock pits after recovery.

At no time sit with your face to the fire while the pock are filling, by which you will avoid the disagreeable appearance of a pitted face. Let the stimulating medicines be given moderately, and, if necessary, a light emetic. But these things had better be omitted, if possible, until after the pustules have filled and the disease has turned. Then a full course of medicine can be administered, and the surface of the body cleansed. When the pock ripens and peels off, a little wax ointment may be rubbed upon the sore spot, which will cause it to heal, and create a smooth skin.

[*Regular Treatment.*—This disease would be treated under the regular practice, by the nse of mercury, opium, antimonials, blisters, nitre, and salts, with the application of ice, and exposure to the cold.]

CHICKEN POX.—*Varicella.*

This disease is sometimes preceded by a distinct precursive fever, of the same general character with that which announces the approach of small.pox. The eruption appears on the third day, in small inflamed spots, on the back and breast. In a few hours a small vesicle rises in their centre, with a whitish transparent covering. On the second day of the eruption, the spots assume the appearance of small bladders, filled with fluid. Being pressed with the finger, they are found soft and elastic. On the third day the fluid becomes turbid, and on the fourth some of the vesicles begin to break and form crusts, while the contents of others condense within them. The drying process goes on rapidly, and by the tenth day the scabs usually fall off. The symptoms of fever are not observed after the second day of eruption.

TREATMENT.

Commence, if soon after the symptoms appear, by giving a dose of composition or cayenne, followed by canker tea and No. 2. If the disease be somewhat advanced, it may be necessary to administer the usual course of medicine, and keep up the perspiration by the use of steaming stones and warm teas. If the bowels are disordered, administer injections.

Under this treatment, the disorder will show itself on the surface, and by keeping up the inward heat, nature will take its course, and the disease will leave the body without any difficulty.

[*Regular Treatment.*—Cooling purgatives, antimony, nitre, opium, and leeches.]

KINE POX.—*Variolæ Vaccinæ.*

This disease may be communicated from fresh vesicles, or by means of the dry crusts which fall off. The third or fourth day after vaccination, the germ of the vesicle may be seen in a very small pimple on the surface of the skin at the place of operation. The vesicle is perfected, with the upper surface depressed, and a red margin, on the seventh or eighth day. On the ninth or tenth day, the margin spreads, the parts become swollen and painful, and the axillary glands are enlarged; restlessness, and other evidences of general irritation are present. At this time a rash is sometimes observable on the chest and neck. The vesicle gradually becomes flat or convex, extends in size, and its fluid becomes opaque and viscid. About the twelfth day the areola begins to fall, the swelling diminishes, and the vesicle gradually dries.

☞ Vaccination ought not to be performed during the progress of the eruptions, or in a bad state of health.

TREATMENT.

The treatment usually should be, to keep the pores open, and guard against taking cold. But if cold have been taken, or any of the above symptoms aggravated, the course prescribed for chicken pox should be administered, more or less vigorously, according to the condition of the patient.

[*Regular Treatment.*—Under the regular practice, the treatment would be, with cooling purgatives, antimony, and nitre.]

MEASLES.—*Rubeola.*

This disease, communicated by contagion, makes its appearance from ten to fourteen days after exposure. The commencing symptoms are, a tickling sensation about the nostrils, sneezing, moistness of the eyes, and a dry husky cough. The presence of fever is also indicated. On the fourth day of fever the eruption usually makes its appearance in deep red pimples, which gradually become fainter as the disease advances, and collect in patches of irregular form, while the space between them appears nearly natural. The febrile symptoms are sometimes aggravated on the appearance of the rash. The headache and fever are somewhat abated in the morning, but increase towards night, and the hoarseness and cough continue while the eruption lasts. This begins to subside on the third or fourth day from its appearance, the redness diminishes, the skin looks mealy and falls off in fine scales. In favorable cases the other symptoms now subside, but sometimes the eyes continue inflamed, and in other cases the cough remains. When the disease has been very severe a torpid, lethargic state sometimes follows the subsidence of the eruption.

TREATMENT.

In treating this disease the principle object to be had in view is, to keep the determination to the surface, and thereby bring out the eruption and prevent its striking in. For this purpose, at the commencement hf the disease, a tea of composition or cayenne should be administered, with the use of a steaming stone at the feet, and other means by which perspiration may be promoted; and in light cases these means alone will usually, with proper attention, perform a cure. But if the case is severe, or by taking cold the eruption has disappeared from the surface, no time should be lost in bringing active means to the aid of nature. To throw off the disease, the best thing, perhaps, that can be done, is to administer a full course of medicine, with the addition of raising a brisker steam than in ordinary cases, and a plentiful use of cayenne in a decoction of witch hazel or red raspberry. Canker tea should be used freely in all cases of the measles, and while under the operation of a course of medicine, cider may be taken in which cayenne has been steeped, or the patient may take freely of pennyroyal or peppermint tea, or almost any grateful drink. Much care should be taken while recovering from this disease, to guard against taking cold or overdoing. In the treatment of measles some people are of the opinion that *powerful* means should be employed, but such is not the case ; mild usage at first will, if persevered in, produce the desired effect, with less inconvenience to the patient and trouble to the attendants.

[*Regular Treatment.*—The treatment of the regular practice would be, giving opium, calomel, nitre, antimony, digitalis, æther, and ammonia, with the addition of bleeding, and the application of ice water.]

SCARLET FEVER—*Scarlatina.*

This dangerous and formidable affection of childhood, when epidemic, does not seem to be dependent for its production on contagion alone. But when apparently springing from contagion, the eruption which is

nearly simultaneous with the fever, appears in about three or four days after exposure. This consists at first of minute red spots, but soon spreads into a general flush, chiefly manifest on the face and breast. The flush assumes a bright scarlet color, not seen in any other disease. The throat becomes affected, which may happen as soon or even before the appearance of the rash, and is marked by difficulty of swallowing, and soreness. The tonsils and neighboring parts of the passage are swolen and intensely red, and in a short time patches of an ashy color appear. As the swelling and ulceration increase, any attempt at swallowing is attended with distress. During this stage the fever does not permanently diminish, and suffers but little remission; thirst is great, the skin hot, headache intense, sleep broken, starting and twitching of the limbs, and frequently delirium. The eruption, perhaps after fading and reappearing, finally subsides. In slight cases the disease terminates from the sixth to the ninth day, by the ulcers healing and relief to all the symptoms. But death may take place in violent cases at an early period or the fever may pass into a typhoid state, with symptoms somewhat resembling continued fever which sometimes continue for weeks, from which the patient usually recovers. This disease is not exclusively confined to children, but in adults more frequently attacks women than men, and its severity and danger are augmented by age.

TREATMENT.

In treating scarlet fever, nearly the same means should be employed as recommended in measles. Beware of employing physic in either case, but make use of stimulating injections, keeping up a gentle moisture of the skin and the strength of the patient, by nourishing broths and gruel. For further directions see page 496. A gargle may be made of cayenne, salt, and vinegar, and a teaspoonful used occasionally to cleanse the mouth and fauces of the filthy mucus, and to remove the inflammation in the throat.

[*Regular Treatment.*—Bleeding, blistering, giving tartarized antimony, æther, and muriatic acid, with cold applications.]

MILIARY FEVER OR SWEAT ERUPTION—*Miliaris.*

The origin of this disease is indicated by its name. It attacks persons of loose fibre and indolent habits, from lying in warm apartments, under too much clothing. It frequently occurs to women in childbed. Its appearance is usually marked by minute red spots, much like the eruptions of measles. The sweat which attends it is frequently of an offensive odor, it is troublesome from itching and tingling, and is attended with thirst, heat of the skin, and often a coated tongue. Its duration depends on the continuation of the producing causes. The fever usually precedes the eruption, continues an indefinite time, and generally terminates in a natural sweat.

TREATMENT.

In effecting a cure of this disease it is necessary to have a due consideration to cleanliness, frequently sponging the surface of the body, with the addition of warming stimulants to raise the vital action. If the stomach is disordered an emetic should be administered, and if the state of the bowels are impaired, make a free use of injections. The treatment to be employed in mild cases of any other kind of eruption will be servicable in this disease.

[*Regular Treatment.*—Blistering, opium, ammonia, musk, camphor.]

NETTLE RASH—*Urticaria.*

This disease is distinguished by the appearance of broad, flat, florid elevations of the skin, which itch and tingle, appearing successively in different parts, without regularity. Its most frequent cause is the presence of poisonous substances in the stomach. It sometimes occurs as an eruption, fever commencing by a regular chill—the eruption showng itself on the second day.

TREATMENT.

Let the patient avoid such articles of food as are difficult of digestion, partaking of a simple diet, composed of nourishing soups, gruels, &c. This treatment, with the use of medicines to restore a healthy action of the stomach and bowels, which have been mentioned in the treatment of similar cases, will usually in a short time have the desired effect.

[*Regular Treatment.*—The treatment of the regular practice is, with mercury, nitric acid and bleeding, with cold applications.]

PRICKLEY HEAT—*Lichen.*

This disease is caused by intense and long continued heat. Its distinguishing symptoms are a diffuse eruption, with red pimples and a sense of tingling or pricking. It is attended with more or less general irritation, and sometimes at its commencement with a slight fever. In the milder form it first appears with distinct red blotches on the cheeks, chin, or arms, slightly inflamed at their base. In a few days the eruption spreads over the neck, body, and lower extremities, producing a sensation of itching; often aggravated during the night. In a week or ten days the eruption fades and the cuticle separates in scurf. This is the common form, but we sometimes see a vivid rash thrown out, occasionally degenerating into wheals like the nettle rash, which remain for a considerable time unless the producing cause is removed.

TREATMENT.

The best way to relieve this complaint is to take freely of hot medicines and excite perspiration. Rub the surface of the body, after the perspiration has ceased, with an ointment made of fresh butter or cream, in which has been simmered a little camphor, pulverized cubebs, or peppermint. This ointment will cause a cooling sensation upon the surface. If this does not relieve take a course of medicine, and keep up the heat until the alarming symptoms appear, and let the patient cool down very gradually. This generally answers in the worst of cases.

[*Regular Treatment.*—Mercury, tartarized antimony, with cooling lotions.]

SHINGLES—*Ceingle.*

This disease is sometimes preceded by some constitutional affection. The first local symptoms are itching and tingling of some parts of the body, which are studded with small, irregular, red patches, a little distance from each other, covered with numerous small elevations. In twenty-four hours they have enlarged considerably, and contain a transparent, limpid fluid. It usually extends in strips from the spine towards the breast bone, but never entirely encircles any part of the body. In a

few days some of the vesicles burst, others shrink up and are formed into scabs, then fall off and leave an inflamed surface.

TREATMENT.

When this eruption makes its appearance keep up a moderate warmth throughout the system by the use of the warm medicines. Anoint the surface with an ointment made of equal parts of yellow lily roots and sage, simmered in fresh butter or lard, with the addition of a little borax or alum. Keep up the temperature as before mentioned, and drive the difficulty out, and dry it up upon the surface with the ointment; it will form a dry scale and come off.

[*Regular Treatment.*—Bleeding, antimony, &c., with cooling purgatives, and refrigerant applications.]

RINGWORM—*Impetigo.*

This disease comes on with an itching and slight local inflammation. It appears in patches more or less circular, with vesicles, existing principally on the margin of the patches, the middle portion being red, tender, and disposed to peel in scales. A single patch sometimes runs through its course in from one to six days, but a new one springs up in its neighborhood, and so succeed each other for an indefinite period.

TREATMENT.

This disease may be cured frequently by the use of tobacco juice. It may also be relieved by washing with hardwood ashes, and when dry wash with vinegar. It may also be washed with lime water, after which apply the vinegar, and when the surface is rough from the application of the lye and vinegar a soothing ointment may be used made of the burs of meadow fern simmered in fresh butter, cream, or hog's lard; or any other softening ointment may be applied, to soften and sooth the rough and irritated surface.

[*Regular Treatment.*—The regular practice is, with mercurial ointment, and internally with calomel, zinc, and lead.]

ITCH—*Psora.*

This is a cutaneous inflammation without fever, consisting of vesicles containing a serous fluid, which may appear on any part of the body, but most commonly in the flexures of the joints, and between the fingers and toes. In severe cases or in advanced stages the vesicles degenerate into pustules containing a yellow matter, and these sometimes uniting form unsightly blotches. It is usually received by contagion; but may be generated by filthy habits. On its first appearance it is sometimes taken for other eruptions, but on minute examination can easily be distinguished.

TREATMENT.

An ointment made of narrow dock, simmered with fresh butter, with the addition of a little spirits of turpentine and sulphur may be applied to the eruption upon the surface of the body. Let the patient take some composition powder or gin sling to drive out the disorder. Gunpowder and cream is a good remedy. Spirits of turpentine added to the No. 6,

is good, all of which should be applied upon the body warm by the fire before going to bed.

[*Regular Treatment.*—The treatment with the regular practice would be, the internal use of mercury, ammonia, sulphuric acid, arsenic, and digitalis, with the external application of any of these articles made into salve.]

Febrile Diseases.

The symptoms of fever are a derangement of the balance of power in the fluids of the body. The consequence is the heat and cold no longer correspond with their usual causes. Cold is felt, notwithstanding the pressure of a warm atmosphere and abundance of clothing; and fever in its turn is felt, notwithstanding their absence. Together with this there is a rapid pulse, headache, and frequently nausea at the stomach. Fever in this sense accompanies, or is a symptom of various other diseases, particularly inflammations. But the term fever or general fever is applicable to a state in which the febrile action is dependent on no external or visible, local disease.

[*Regular Treatment.*—The treatment of fevers by the regular practice is bleeding, with mercury, nitre, opium, salts, quinine, and sulphate of copper.]

INTERMITTENT FEVER—*Febris Intermittens.*

A regular paroxysm of intermittent fever consists of three stages. The patient exhibiting at first languor, debility, unwillingness to move and a disposition to yawn on being disturbed as if aroused from sleep. At this period the extremities will be found colder than usual although no difference in the temperature is visible to himself. Presently a chill commences, invading the back and then the rest of the body, with a sensation or creeping, crawling, or tremor. The state of chill when perfect is marked by extreme cold, which requires an immediate application of warmth to raise the temperature, of the body. At the same time there is a degree of tremor or shivering usually more violent than the impressions of external cold. At this time the skin is warmer than usual notwithstanding the sensation of chill. After a certain time the sensation of cold begins to remit and occasional hot flashes are experienced. This state of things indicates the proximity of the

Second Stage—Which by degrees commences by the cessation of the cold, and an unnatural heat ensues. With this state the color is increased over many parts of the body, and especially the face, which becomes of a bright scarlet color, the skin becoming dry and disagreeable to the patient.

The third Stage.—Perspiration starts, which produces gradual relief to the patient by the mitigation of the febrile symptoms. The surface of the body becomes cold, the countenance gains its wonted aspect, and the functions for the most part return to their natural state.

In the *Cold Stage* the pulse is frequent, small, and irregular, the breathing anxious and sighing, attended occasionally with cough.

In the *Hot Stage* the pulse becomes regular, hard and full, and increases in those qualities till the sweat begins to break out. The respiration becomes more full and free and continues frequent and anxious.

In the *Sweating Stage* the pulse becomes soft and less frequent returning gradually to its natural state, and the anxiety and difficulty of breathing are removed.

The appetite fails from the commencement to the disappearance of the paroxysm, and in general the patient has a great aversion to food, sickness at the stomach, frequently vomiting a bilious matter in both the cold and hot stages. Thirst and excessive dryness in the mouth and throat, continue during the paroxysm of fever, but subside as perspiration ensues. Lastly headache, attended with a peculiar throbbing of the temples and back of the head, and pain in the limbs. The interval between the paroxysms of an intermittent, is a period of comparative health, and the term of time between those paroxisms, determine the type of the disease. If the space of time be twenty-four hours, the fever is termed *quotidian*, or daily; if forty-eight hours, so that the second paroxysm happens on the third day, it is called *tertian;* if seventy-two hours, a *quartan*. A fever having but one paroxism has been termed *ephemeral*, and was once called the sweating sickness, when it prevailed in England.

TREATMENT,

A thorough course of medicine and a continued perspiration will frequently break up the fever in twenty-four hours. Should one course not succeed, apply the second, and so continue until the complaint is removed, making use of the bath daily to throw off the morbid matter that may have accumulated upon the surface; also take restorative medicines for the digestive powers during the intervals. These fevers may all be removed by simple treatment.

[*Regular Treatment.*—Bleeding, mercury, jalap, antimony, copper, ammonia, arsenic, and quinine.]

YELLOW FEVER—*Typhus Icterodes.*

The symptoms which distinguish this from other fevers, are the following: Slight chills accompanied with faintings; sickness at the stomach constantly from the first, and the inclination to vomit increases with the disease. At first the matter vomited is yellow, and on the second or third day it is green, and towards the fatal termination black, or of a slate color, and resembling coffee grounds in consistency. The yellow color of the skin, which is by no means peculiar to this disease, is first developed on the third or fourth day, in the eyes, neck, and breast, and thence extends over the rest of the body, which in fatal cases becomes yellow throughout; the urine is of a dark saffron color; the tongue is covered with a moist yellowish white coat, then it becomes more dry and discolored, and finally quite black.

The time for the disease to reach its fatal termination is various; in some instances in twenty-four hours, in which the skin is less strongly marked. When it runs four or five days it exhibits decided remission, such as would lead a person not experienced to anticipate recovery; but afterwards the spirits and strength revive only a few hours before death. When the peculiar variety above mentioned takes place, the disease almost always proves fatal.

TREATMENT.

This disease should be treated with the most rigorous course of medicine, and a continued perspiration kept up. The surface should often be bathed with a strong alkaline wash made of hard wood ashes put into water and allowed to settle, and then mixed with whiskey or West India

rum, to clear the glutinous substance from the pores and prevent an absorption of the morbid matter that has worked out by perspiration. Baths should be used daily, and the temperature of the system generally should be kept as regular and as near that of health as artificial means will permit. Soups and gruels highly seasoned, should be taken as food and strong tonic mixtures, such as bitters, syrups, &c. to strengthen, should be used as soon as the state of the stomach will permit of such treatment. The saline properties of the blood becomes much reduced by this disease, by which means the system becomes very putrid, therefore pepper and salt should be used in great profusion in nourishment after thorough courses of medicine. See page 515.

[*Regular Treatment.*—Bleeding, mercury, jalap, colocynth, opium, and cold applications.]

SPOTTED FEVER—*Typhus Gravior.*

This disease derives its name from the dark colored spots it exhibits upon the skin, caused by the extravasation of blood beneath the cuticle. It may be described a nervous fever, in which the stage of reaction is wanting, attended with pain in the head, virtigo, paroxysms of gastric sinking, generally with a slow pulse, and no febrile smell. Petechial eruptions, injection of the capillaries, coma, delirium, palpitation, numbness and sinking after evacuations, are more common than in any other febrile disease. It bears a striking resemblance to malignant cholera, It varies much in its symptoms, and equally as much in the time of duration. It sometimes resembles common nervous fever, at others low typhus, while at other times it is attended with vomiting and diarrhœa. It sometimes continues but a few hours, but more generally five or seven days, and sometimes two or three weeks and even occasionally as many months.

TREATMENT.

In light cases it is generally sufficient, if attended to in season, to raise a profuse perspiration, by administering composition with the addition of cayenne and rheumatic drops, being placed over a lively steam. Then let the patient be placed in bed with a steaming stone at his feet, and occasionally given warm tea to continue the perspiration. But in more obstinate cases, or when the disease is further advanced, in addition to the above treatment give strong canker tea, and when the perspiration is free, administer an emetic of lobelia, in three different doses, once in fifteen minutes. When under this operation let them take freely of any grateful drink, and after the vomiting has ceased give them milk porridge or water gruel. When the perspiration is nearly done and their strength somewhat recovered, steam them as long as they can bear it, then rub them with spirits and water or vinegar ; change their clothes, and let them sit up or go to bed as their strength will permit. When the patient is so weak as not to be able to get up let them be steamed in bed as hot as they can bear it, then rub them as before mentioned, and change their clothes and bed clothes. The last direction is all important, for unless all the clothes that have been around them are changed they will absorb a part of the filth that has been discharged and thus add to what is left of their disorder. Those who attend upon the patient are in danger of inhaling the foul vapor and thus taking the disease themselves, which may generally be prevented by taking hot bitters or chewing ginger root

If the above treatment on the first trial does not prove sufficient to throw off the disease, let it be repeated at the discretion of the practitioner. Afterwards use restorative medicines as in other cases of recovery.

[*Regular Treatment.*—The treatment of the regular practice is bleeding, blistering, with calomel, jalap, antimony, and arsenic.]

Erysipelatous Affections.

ERYSIPELAS.

This is an eruptive fever of a typhoid character, most frequently occurring to those of advanced life, or debilitated constitutions. Its approach is insidious, its preceding fever often being very light. Sometimes there are chills and heat, accompanied by drowsiness and even delirium. About the third day there is a redness seen on some parts of the person affected. At first this is very indistinct, but it gradually spreads in all directions, and as it advances becomes prominent, and its outlines more perfectly defined. If it attacks the face, the nostrils become swollen and painful, and the eyelids often enlarge so as to entirely obstruct the sight. In many cases only one side is affected, when the boundary can be traced along the ridge of the nose, dividing the chin, lips, and scalp, in the centre. The features, and particularly the mouth, are often distorted. The morbid action involves the whole thickness of the true skin, which becomes unnaturally hard. Blisters begin to form on the second or third day. The matter effused is yellowish or livid. When blisters do not appear, the skin usually dries in fine scales. The inflammation continues from eight to twelve days, during which time the eruption travails over different parts. As it ceases to spread the disease subsides.

The symptoms indicating danger are delirium and drowsiness, from which the patient is aroused with difficulty.

TREATMENT.

This difficulty can be cured by making use of emetic pills for several days in succession, and taking several steam baths; after which take a thorough course of medicine and keep up the perspiration, until the disorder comes to a crisis, has a regular turn, and scales off in a dry kind of dust from the surface.

[*Regular Treatment.*—The regular practice is bleeding, blistering, and physic.]

POISONED WOUNDS.

The most familiar instances of poisoned wounds, are those inflicted by insects, which have the power of inserting into the wound some peculiar fluid, capable of producing a specific effect. In the bee, this poison lies in a small bladder at the base of the sting. The poison flows from the vesicle through the sting at the moment it is inserted; and the mechanism in all venomous animals is nearly the same. The inflammation which is produced by the sting of any of the smaller insects, generally subsides of

itself; but in some instances, when it was inflicted on tender parts, it has produced danger, and even sometimes death. The most severe poisoned wounds are inflicted by the rattle-snake, viper, scorpion, &c.

The bite of these animals is followed by local pain, swelling, redness, and a speedy disorganization and effusion of the blood. Subsequently, the pain abates, the part becomes cold, and mortification succeeds. In severe cases the symptoms are, prostration, anxiety, difficult breathing, and profuse sweats. In advanced stages, the skin is cold, the heart scarcely pulsates, the stomach retains no liquid, and delirium soon supervenes. The consequences which follow the bites of venomous snakes are, however, modified by a variety of circumstances; and in some instances the persons have escaped with trifling inconvenience, while in others death has taken place in a few hours.

TREATMENT.

Make use of hot medicines to keep the poison as much as possible from the stomach, and use a course of medicine immediately if simples fail in answering the purpose. Let a cloth be wet with the tincture of emetic and camphor and put upon the wound, and keep it moist with the same medicine. This will act as a neutralizer of the poison, and by the use of the hot medicines the stomach will become strengthened against the attacks of the virus through the circulating medium. But in such cases the thorough course of medicine, with the above application of camphor and emetic, is the surest course to health for the patient. Perspiration in all cases should be kept free. The diet should be light, such as soups, gruel, &c. well seasoned with pepper and salt—salt of itself being a counter poison. Perspiration will exhaust the poison through the skin.

[*Regular Treatment.*—Bleeding, physic and opiates, with scarification and caustics, and zinc, vitriol and copper.]

Diseases of the Respiratory Apparatus.

CATARRH.—*Catarrhus.*

The symptoms or causes of a common cold require no description. In itself it is a mild degree of inflammation, usually commencing in the mucous membrane of the nose, and often extending through the fauces, larynx, or the whole length of the air passages. Its tendency is to produce an increased and vitiated secretion of the natural mucus. When chiefly confined to the larynx, fauces, and nasal cavities, its effect scarcely produces any febrile action; but when the air passages are involved, the sympathetic fever is often quite severe. Catarrh in itself is very rarely a dangerous affection.

There is a peculiar form of chronic catarrh, the obstinacy of which depends on a dyspeptic condition of the stomach. There is also another form, peculiar to elderly people, the symptoms of which are an habitual cough, loose expectoration, occasional hoarseness, and increased secretion in the nose and fauces. This is its most obstinate form.

TREATMENT.

Take one tablespoonful of the composition powders, one teaspoonful cayenne, one tablespoonful fine poplar bark, and one teaspoonful golden

seal; mix this compound well together, and put a tablespoonful into a pint of boiling water, sweetened, and it is fit for use. Take a wineglassful six or eight times a day. This will raise the general temperature of the body, and the disease in the head will heal.

A useful snuff, to be taken while using this medicine, may be made of one part fine bayberry bark, one part fine bitter root, and one part finely pulverized witch hazel leaves.

A course of medicine may be very useful in two or three days after the commencement of this treatment; and let it be repeated if the improvement is not satisfactory. Costiveness should be attended to by all means, and the blood made to circulate freely in the lower extremities, thereby reducing the pressure from the vessels in the head.

[*Regular Treatment*—The regular practice is bleeding, blistering, mercury, digitalis, antimony and opium.]

INFLUENZA.—*Cynache Pharyngæ.*

This is a febrile disease, accompanied by inflammation of the fauces, the air passages, and more or less the substance of the lungs. Its symptoms are those of catarrh, in addition to which are great hoarseness, wheezing, rapid pulse, hot skin, nauseous stomach, and head-ache. The fever is usually regularly remittent, but occasionally assumes an irregular intermittent type. In some particular epidemics the disease has been attended with cramp, painful cough, extreme debility, and delirium. It is sometimes very mortal among the robust, but the more delicate, especially women and children, usually escape with a lighter paroxysm.

TREATMENT.

Bathe the feet in hot water, as directed for pleurisy, after taking a glass of composition; after bathing, wipe dry and make use of the stimulating liniment. Then put the patient in bed, with a hot brick at the feet, to draw the excessive circulation from the head downwards. Apply a stimulating or strengthening plaster to the neck, notched at the sides so that it may extend to the edge of the chin; put over this two or three thicknesses of flannel. By this treatment, in two or three hours the inflammation will generally be reduced in a great measure, and the patient relieved.

When the case is very bad, after bathing the feet and getting the plaster about the neck, if swallowing is difficult, make use of an injection of composition, or third preparation, sufficiently strong to induce vomiting. This will clear away all obstructions, and there will be no difficulty in swallowing afterwards.

This course of treatment is useful in all cases where there is an excessive circulation of blood in the head or upper extremities.

[*Regular Treatment.*—Bleeding, blistering, squills and antimony.]

PLEURISY.—*Pleuritis.*

An attack of this disease is usually accompanied with acute pain in the chest. The pain is sometimes dull and heavy, at others acute, and is always increased by a full breath. When a full breath is inhaled, a cough, usually short and dry, is produced. Ordinary breathing is attended with soreness or pain. The pulse is hard and frequent, while the other symptoms of fever are not generally very strong.

The seat of this disease is doubtless the pleura, or investing membrane of the lungs.

TREATMENT.

Take a dose of composition, cayenne, or hot drops; then put the feet into water as hot as the patient can bear it; raise the temperature by adding hot water, keeping it as hot as it can be borne. Keep up this operation till a lively perspiration starts in the palms of the hands and on the forehead. Then wipe the feet and legs dry with a cloth, thoroughly, with the stimulating liniment. This treatment will equalize the heat of the body, and usually relieve the pain in a great measure. Then put the patient into a warm bed, with a hot brick, stone, or jug of water at his feet. If this is not sufficient, administer an emetic, which will generally afford relief; but if it does not, make use of a thorough course of medicine.

The reason why we do not direct a thorough course of medicine at the commencement is, that light treatment is preferred by most people at first, and frequently answers the purpose.

[*Regular Treatment*.—Copious bleeding and blistering, with antimony and opiates.]

LUNG FEVER.—*Pneumonia.*

The symptoms of lung fever are, acute pain in the breast, lassitude, loss of appetite, usually accompanied with chills, and sooner or later with a sense of tension, or weight upon the part. The chill is succeeded by great heat, then an acute pain attacks the chest, usually the middle of one side, extending even to the collar bone and shoulder. The breathing is frequent and short; a hard, painful and frequent cough, and a frothy expectoration, sometimes tinged with blood, sometimes green or yellow, and in some severe cases wholly wanting. The pulse is very uncertain; the action of the heart is strong, and sometimes a sensation of heat, or burning. The countenance is flushed, tumid, and the lips dark and livid; but sometimes general paleness and a contracted aspect indicate a collapse. Often an abundant viscid sweat appears about the neck and face, accompanied with a hot and dry state of the other parts of the body. The patient manifests an aversion and hesitation in answering questions. The tongue is dry, the swallowing is difficult, and the thirst intense. In some cases the only posture tolerable is on the back, with the head and shoulders elevated; but more usually on the affected side.

The above symptoms are common to all well marked cases; but in its most severe form, the eyes are extremely red and prominent, the tongue swells, and stupor or delirium succeeds. In fatal cases, these precursors of death appear in about seven days.

TREATMENT.

This disease shows that the fluids are so closely confined in the trunk of the body that there is danger of immediate dissolution by mortification if a universal and free circulation is not effected. Stimulating medicines should be immediately used, to create an active circulation. The feet should be most thoroughly bathed in hot water, and the strongest kind of liniment applied; then the patient should go into a warm bed, with a hot stone at the feet. This course will have a tendency to equalize in a great measure the fluids of the body. Then a thorough course of medicine will produce the happiest effects to the patient. The diet should be crust coffee, with milk and sugar, and milk porridge, or light soups. Tincture of emetic should be freely used, in small quantities, to make the expectora-

tion free. The veins in the hands and feet should be kept full. This is a guide to the practitioner for a correct temperature.

[*Regular Treatment.*—Bleeding, with nitre, salts, mercury, antimony, and æther.]

CONSUMPTION.—*Phthisis Pulmonalis.*

This disease usually comes on without severe inflammation, and arrives at maturity almost, without the patient suspecting he has any serious disease. The first symptom is a slight, short cough, soon becoming habitual, but so mild as to lead the person to the supposition that he has no settled cough whatever. A close observer, however, may ascertain, that the breathing is easily hurried by motion, and a diminished disposition to action, attended with some emaciation.

The person may feel no aggravation of these symptoms, except an increased liability to cough on taking cold than formerly, for even a year or two; but the cough is frequently easily relieved, and no solicitude is experienced. The cough thus far is usually most troublesome on lying down at night, but frequently not attended by expectoration. At length it becomes more constant, and is attended, especially in the morning, with raising phlegm from the lungs. The discharge gradually becomes more abundant, less transparent, then yellow or greenish, and finally assumes a corrupted appearance. The pus which is now thrown up is mixed with viscid white phlegm. Weakness and emaciation increase, and breathing is more laborious. Many of the natural secretions are checked; females, especially, perceive a change of system.

Feverish symptoms are now manifested, especially towards evening. The hectic fever soon observes its regular periods—twice in twenty-four hours. The morning fever comes on about noon, then somewhat subsides, but is succeeded by another paroxysm towards evening. The morning paroxysm is attended with a flushed cheek, and in the evening the cold stage predominates. Towards the termination of the disease, abundant sweats follow the chills. Pain in the side becomes nearly constant. Night sweats are a prominent symptom. Spitting of blood is always observed in some stage of the disease. Finally, the feet swell, the tongue is red and clean, and the eyes assume a pearly lustre. Still later, the bowels become obstinately loose, eruptions break out in the mouth, and the strength is rapidly exhausted.

TREATMENT.

We will take a retrospective view of this disease from its commencement, and pass through its various stages to its termination, that our reasoning may be understood.

In the first place, our subject is supposed to enjoy good health, and by some means he takes cold, by which the vital warmth is reduced; and as every person has his particular weak parts, our man is one that is usually denominated of a consumptive habit, a slender constitution, although the most robust are not entirely free from the liability of being attacked with this complaint.

The person takes cold, by which means there is a reduction or absence of vital warmth upon the lungs, in consequence of which the glandular juices and saliva generally become thick and adhesive, in proportion to the quantity of warmth lost, the same as the blood, which congeals from the loss of heat. The saliva does not flow free, but adheres to the mucous membrane over the small vessels that have omitted it; and a constant inhalation of the cold atmosphere renders it more stiff and adhesive,

which confines it closely to the small vessels from which it has emanated. The constant emission of these juices from the glands is necessary, but in consequence of the stiff adhesive mass with which they are now covered, the juices cannot readily escape; the glands become so much more overcharged and distended than usual, and the juices pressing to escape from their confined situation in the vessels, that an irritation, or in other words a tickling sensation takes place, which causes an involuntary cough to assist the lungs to detach the matter. The more the person coughs, the more cold air is inhaled, and consequently the more the juices lose the warmth, and become more adhesive and stiff, which requires a greater effort to throw it off, and a greater degree of vital heat is forced to the surface by the additional chill received by the respiration at the lungs.

This constant receiving by hard coughing new and extra supplies of cold air, to assist in detaching the mucus from the mucous membranes, and the effort made to force the breath from the body, frets the membrane so that the surface is removed, leaving the lungs sore, and suppuration now begins to take place. The sore is small at first, to be sure, and if it was upon the surface of the body, where a plaster could be applied to keep off the external air, it would soon heal; but upon the lungs such a remedy cannot be applied.

How natural it is, if we bruise or injure our flesh in any way, to put upon it a plaster of some kind, in order that it may heal. And why is it necessary that a plaster should be applied? We reply, the flesh has been used to a shield, to protect the small vessels in the performance of their various functions from the action of the external air, and a plaster acts as an artificial covering, until nature is able to restore that one which has been injured or partially destroyed.

If the sore is left exposed to the air, the small vessels contract at the surface, and the blood stops circulating in them, by which means the perspiration measurably stops and is accumulating in a body within, and the flesh upon the surface puffs up, or swells, and is very sore, which is not the case to so great an extent when the oily texture of the plaster adheres around the sore, to guard the exposed and injured vessels in the performance of their duty, and retain the warmth that would escape from the sore, if this artificial covering was not present to protect it.

The lungs should be protected, precisely upon the same principle as a sore upon the surface. The sore is kept temperate by the plaster, which shields it from the various changes of air through which the body passes. The sore remains constantly warm, while the little machinery is carrying on its various operations. In the process of healing, the injured parts of the flesh maturate and adhere to the plaster, and should be removed certainly as often as once in twenty-four hours. If not, an uneasy, itching sensation takes place, to show the person that the vessels are becoming overcharged, and should be relieved by removing the matter and renewing the plaster; and this is a warning that should never be disregarded, as the sore will not heal from such time until the matter is removed.

So with the lungs. The matter must be removed once in twenty-four hours, or the patient is distressed. The situation of the two subjects is similar, but the sores are not alike accessible to the application of the same remedies; and inasmuch as the lungs cannot be affected by such remedies as are suitable for the surface, so we must regulate that element or power that does come in contact with them, that is, the air. But the air should be made temperate in its natural state, without destroying any of the principles that it possesses by nature for our good. Or, in other words, the oxygen should not be destroyed by any means whatever, as that is the life of the air, and by its destruction, by an iron stove or stone

coal in a close room, the air would become dry, and the patient would receive more injury than if he remained subject to the various vicissitudes of the cold air.

We must be constantly breathing and receiving upon the lungs the air that surrounds us. Under such circumstances, it is necessary that we get into that kind of atmosphere which will keep the lungs in a temperate state as near as possible, as much so as if the sore was upon the surface, comfortably enclosed by a genial plaster.

It may be asked, where can a consumptive person find such air? To which we reply, many go to the West Indies, where it is to be found for one half of each twenty-four hours. But the great quantity of moisture that is exhaled into the air under a vertical sun, is condensed at evening, and returns to the earth in the form of water or dew, and impregnates the atmosphere with such excessive humidity, that unless the patient shuts himself up in a tight room, and has a lively fire burning, to keep the water in the form of air in the room, and the room as warm as the air was in the middle of the day, he will lose all at night which he gained during the day.

In consequence of the scarcity of fuel, and the warmth of the weather, in the West Indies, fires are seldom in use during the evening for the native inhabitants, and a person from the north would be unwilling to make such a request in so warm a climate; consequently he would lose at night, perhaps through diffidence, what he had gained through the day by care. And after a stay of some three, four, or six months, he returns to his friends, much worse, and in a state that soon carries him off by consumption.

Now our opinion is, the man should never have left home. If he had wanted a West India climate, it should have been manufactured in his own house, where he could have had friends who regarded his restoration to health more than his money. For when he thinks he is travelling for his health, he labors under a mistake. He only travels to spend his money; and many of those he employs to wait upon him generally do his bidding for his money, and would, even if it were to take his life.

But how different are the attentions which a sick man receives from an affectionate wife, a father, mother, brother or sister, whose only solicitude is for the recovery of their friend's health. The labor and attentions of such friends are not measured by dollars and cents, but by the good they may bestow upon their relative.

Being of a consumptive habit myself, and having in 1832 been brought very low by that disease, by raising blood, it may not be amiss for me to give a short account of the treatment I received.

It was said by some of my enemies, "If Thomson's medicine is good, let us now see the effects of it upon himself." I will not say as one of the regular physicians did, when he was coughing very hard. A friend of his says, "What, doctor, do you suffer yourself to cough in this manner, and have so much good medicine, and skill to use it too?" "O," says the doctor, "I keep that for my patients; and indeed I had rather give you half a dozen doses of my good medicine than to take one myself."

But to the point. When I was raising blood, and troubled with a violent cough (which were brought on by over exertion in time of the cholera) I saw the necessity of a temperate air in the room, averaging from 75 to 90 degrees of Farenheit; and as it was more than probable that my disease came on by the feet, by standing or exposure to the cold, I turned my attention to them, and bathed them in hot water, and after that a coat of liniment, keeping a proper temperature at the lungs by the use of hot medicines.

I was very particular to see that the circulation in them was kept good, or in other words, to see that the veins were kept full of blood, and I occasionally took a course of medicine, to remove the morbid matter from the system. Thus the system was kept temperate, the excess of blood or pressure was kept from the head and lungs, by warm feet. The air that I breathed kept my lungs in nearly the same state in point of warmth that I should have kept a sore in, upon the surface, by the application of a stimulating plaster.

My appetite was good, and I eat various kinds of meat and sauce, or such as I had an inclination for, or fruit of all kinds of which I was fond, such as damson plums, peaches, water and musk melons, grapes, pears, apples, &c., some of which were unripe, without receiving any injury; and indeed, after I put myself into the state above mentioned, I seldom passed a moment when I did not think myself rapidly improving, both in strength and health. My cough and raising diminished daily, in proportion as the wound healed; for where the sore is closed there is no collection of matter, consequently there is no occasion for an effort of nature to throw it off.

During the time I confined myself to my room in the above temperature of air, and commenced taking medicines, my system was kept so temperate that I was not often sensible of having a paroxysm of fever, which invariably attends cases of consumption. But before I confined myself I had them daily, and generally coughed two hours on going to bed at night, during which time, and in the morning, I would raise about *half a pint* of matter. I had also a copious weak sweat, so called, which debilitated me to that degree that I could scarcely stand without help. I was restored to health in three months. J. T.

[*Regular Treatment*—Would have been, bleeding, blistering, digitalis, prussic acid, sulphate of iron, opium, cinchona, &c.]

SPITTING OF BLOOD.—*Hæmoptysis.*

It is a question of importance to determine when blood is ejected from the mouth, from whence it proceeds. If from the posterior nostrils, it is easily distinguished by the facility with which blood appears by blowing the nose. If from the throat, it can be determined by ocular inspection. If from the stomach, it is usually raised by vomiting, and from the lungs by coughing; yet this test is not quite certain. When the blood comes from the stomach, it is usually in larger quantities than when from the lungs. The blood from the lungs is usually florid, and mixed with froth, while that from the stomach is combined with substances peculiar to that organ, and is of a dark color.

TREATMENT.

Bleeding at the lungs or stomach may be stopped by the use of a strong dose of the composition, with cayenne, which will force the blood into the larger vessels of the extremities. The stimulating treatment should be constantly kept up, by not only the use of medicines, but by bathing the feet in hot water, and after that with stimulating liniment, to keep the blood equal through the body, as much as possible. A temperate atmosphere should also be kept in the room where the patient remains, by the use of a good fire place or soap-stone stove, if practicable. As a West India climate is beneficial to consumptive people, so an atmosphere manufactured of a West India temperature is good for consumptive patients, if rigidly followed up by the sick until the internal sores are healed. All

internal sores, where a plaster cannot be applied, must be healed, if cured at all, by a temperate atmosphere.

[*Regular Treatment.*—Bleeding, digitalis, opium, and sulphates of iron, zinc, and lead.]

ASTHMA.—*Asthma.*

Asthma is a difficulty of breathing, usually occurring in paroxysms, in the night after intervals of comfortable health, and not often accompanied with fever. A paroxysm of asthma usually comes on during the soundness of sleep, and the patient is awakened with a sense of suffocation and constriction across the chest. He is obliged to sit erect, and labors with much difficulty for breath. The breathing is accompanied with a constant wheezing, the pulse is low, the heart palpitates, the extremities are cold, and the face is pale. At length a cough occurs, expectoration is induced, and relief is usually obtained. A paroxysm generally continues from one to three hours.

TREATMENT.

This disease may always be measurably relieved by putting the feet into hot water, and increasing the heat until perspiration starts upon the temples and in the palms of the hands. Then make an injection of molasses and water, adding, while hot, some cayenne and a teaspoonful of brown emetic, to change the excitement from the lungs below to the bowels, and fill the blood vessels of the extremeties, so as to cause a free and easy perspiration, which will always be the case when the costive habit is removed, and a warm and active state of the bowels ensues, together with warm extremities.

A teaspoonful of the tincture of emetic may be used occasionally, to create sickness at the stomach, which, together with the brown emetic injection, will generally relieve the patient very soon, by sickness and vomiting, unless he is aged and worn down with disease. In such cases, temporary relief may be experienced; but the air vessels of the lungs having become so much constricted, from long continuance of the complaint and the loss of the natural vital energy, the moment the stimulating effects of the medicine cease the vessels fall back to the old standard, nature not being sufficiently strong to retain what was acquired by the application of the medicine.

If asthmatics will but attend to keeping the feet warm and the bowels regular, respiration will be free and easy. It should always be remembered, that respiration cannot be regular without suitable warmth in the lower extremities; and due attention should be paid to this part of the body.

[*Regular Treatment.*—Opium, stramonium, tobacco, foxglove, æther, mercury, with bleeding and blistering.]

ANGINA PECTORIS.—*Anginosa.*

This disease usually makes its attacks while a person is exercising after a full meal. Severe pain is felt in the front of the breast, extending generally towards the left shoulder, thence shooting downwards in the direction of the arm and hand. The pain is so severe as immediately to arrest the patient. In a few moments it subsides, but occurs again at irregular periods, each attack lasting longer than the previous one, and at

length they are accompanied by a sense of suffocation. When once habitual, it is very easily excited.

Thus this disease may continue for several years with no other marked effect of debilitated health. It sometimes, but not often, subsides spontaneously. More frequently, the paroxysms continue to increase with progressive violence, till at length the patient, overcome with pain and suffering, in all the agony of suffocation breathes his last.

TREATMENT.

Equalizing the fluids of the body will generally relieve this complaint, if done by a thorough course of medicine, and light dieting. The sense of suffocation shows the want of circulation in the feet, and an excess in the regions of the heart, lungs, and head—to which the attention of the physician should be immediately called.

This complaint attacks those persons who may be denominated of a gouty habit, and nearly the same treatment as in that disease will answer the purpose. In many cases it is brought about by high living, and should be removed by the opposite course, provided active remedies are not used for an immediate cure.

Substitute crust coffee, milk porridge, soups, and cold water, for beef steaks, roasted turkeys, plum puddings, and champagne.

[*Regular Treatment.*—Cantharides, sulphuric æther, ammonia, tartarized antimony, mercury, sulphate of iron, and blisters.]

Diseases of the Throat.

MUMPS.—*Cynanche Parotidæa.*

This disease, which is an inflammation of the parotid gland, is a hard painful swelling, on one or both sides of the neck, behind and above the angle of the jaw. It is not very tender, neither does it produce much fever. After increasing three or four days the swelling gradually subsides. It is most common in children, although adults are sometimes affected with it.

TREATMENT.

Keep the feet warm by bathing with liniment, and the bowels regular by the occasional use of a tablespoonful of castor oil in a cup of prepared composition. Also, put a stimulating plaster about the neck, and let it extend up to the hair in front of the ears. This will reduce the swelling and inflammation, and give ease to the patient. A warm stone should be put to the patient's feet.

Let the diet be light, such as milk porridge, soups, or crust coffee, and be particular not to take cold during the continuance of the complaint.

[*Regular Treatment.*—Cantharides, ammonia, tartarized antimony, mercury, cathartics, and blisters.]

QUINSY.—*Cynanche Maligna.*

Quinsy commences by a sense of uneasiness in the throat, soon amounting to soreness, aggravated by every attempt at swallowing. The tongue is coated white, the fauces are of a deep scarlet hue, and the tonsils so

much enlarged as to fill up partially or wholly the interval between them and the uvula. As the swelling increases the gland encroaches upon the uvula, and pushes it towards the opposite side. The difficulty in swallowing becomes extreme, and when attempted, the liquid is forced into the nostril. In very bad cases, the countenance indicates great distress, breathing is difficult, the jaws are not easily separated, and the voice becomes almost inaudible. But death seldom occurs from this disease alone.

TREATMENT.

This complaint should be treated by stimulating the lower extremities to action, by bathing the feet in hot water and liniment, then keeping warm in bed. If the case is severe, make an injection of composition and No. 3, and put into it a teaspoonful of cayenne, and two tablespoonfuls of the third preparation, or in its stead one teaspoonful of brown emetic, scalded in the tea before mentioned, sweetened with molasses. Let it be used forcibly, and kept in the body as long as possible, and if it excites vomiting, it will relieve the throat and head at once.

This complaint should be treated the same as putrid sore throat, the mumps, and other complaints of the chest, neck and head. I again repeat, change the scene of excitement from the upper to the lower extremities, and all will be well.

[*Regular Treatment.*—Bleeding, mercury, jalap, tartarized antimony, muriatic acid, and ammonia.]

CROUP.—*Cynanche Trachealis.*

Croup is seldom met with, except in children under six years of age, and most usually makes its attacks in changeable weather.

The *decisive* symptom is the shrill sound produced by breathing. Other marks of the disease are, a husky cough, a deep red color of the throat, and an appearance of pus or froth at the roots of the tongue. The disease is of short duration, either being relieved or terminating in death in a few hours. In its most dangerous stage, a circumscribed flush appears on the cheeks, accompanied by a small quick pulse, blood-shot eyes, &c. Cases of croup in adults have rarely been known.

TREATMENT.

Give a little warm medicine, and then put the feet into hot water, and increase the temperature by adding water, keeping it as hot as it can be borne. Keep the feet in this state until a perspiration starts throughout the system, and respiration becomes as free and easy as circumstances will permit. Then commence by giving an injection of emetic and cayenne, as strong as possible; at the same time feed the child with warm tincture, sweetened, with a little ginger, spearmint, peppermint, or pennyroyal tea, which will make it operate. Place the patient into a warm bed, and put a stimulating plaster about the neck and over the stomach, a hot steam stone at the feet, and continue to feed with the tincture until it has operated sufficiently. Continue a moderate temperature, and the patient will soon find relief.

The first stages of croup may be relieved by putting a plaster upon the breast made of Scotch snuff and hog's lard. This will sicken the stomach a little, and loosen the phlegm; and by the use of a little tincture, the child will vomit and find immediate relief.

But in all cases, see that the feet are suitably warm and the bowels re-

gular and active; this will cause free respiration, and clear the head of distress, thereby avoiding hydrocephalus, or dropsy on the brain, so called, which is brought about by disordered bowels and cold extremities, and a consequent pressure of the active fluids of the extremities upon the brain.

[*Regular Treatment.*—Bleeding and blistering, with antimony and mercury.]

Diseases of the Abdomen.

VOMITING AND PURGING.—*Cholera Morbus.*

The attack of this disease is generally sudden. In some cases it is brought on by pain, lassitude and acid eructations; at other times it commences by vomiting and purging, the purging not usually commencing first. The matter ejected, besides the undigested food, if any, is bile, varying in color from its natural yellow to a green, brown or black, and mixed with mucus. After continuing a considerable time, the discharges assume, perhaps, the appearance of the washings of fresh meat. It is frequently attended with spasms in the abdomen and extremities, and the patient's strength is soon exhausted. In violent cases, collapse succeeds, and unless relief is obtained, death in a few hours puts an end to the sufferings of the patient.

TREATMENT.

This disease may generally be relieved by a single dose of composition or hot drops. If this does not answer, bathe the feet in hot water and take an emetic, or a thorough course of medicine, if required, which is generally effectual.

[*Regular Treatment.*—Bleeding, blistering, calomel, opium, and carbonate of iron, ice water internally, and ice externally.]

PURGING.—*Diarrhœa.*

Diarrhœa is an increased, loose discharge from the bowels, the matter voided usually possessing its natural color. A griping pain is felt previous to each discharge, which is thereby relieved. There is a moderate thirst, an impaired appetite, and a slight tenderness of the bowels. Its most frequent causes are the abuse of unripe fruit, atmospheric changes, and teething; although it is not unfrequently induced by affections of the mind.

TREATMENT.

The prepared composition is good for this complaint. For syrup, take an ounce of bayberry, an ounce of poplar bark, made fine, an ounce of peach meats or cherry stones, pulverized, and put the compound into one quart of boiling water, steeped for ten minutes, strained off and sweetened with loaf sugar, and add half a pint of good Jamaica rum. Take one fourth of a glass three or four times a day.

Take an emetic or course of medicine if the stomach is out of order.

[*Regular Treatment*—Opium, antimony, cantharides, alum, catechu, tincture of kino, and extract of logwood.]

DYSENTERY.—*Dysenteria.*

The characteristics of dysentery are, an earnest desire to evacuate the bowels, succeeded by a severe straining, which expels a small quantity of matter, unmixed with the natural discharge, resembling mucus; the pain ceases for the moment, but is soon followed by the same desire and discharge, which is frequently mixed with blood. A continual fever accompanies this disease, and as it advances the character of the discharge has the appearance of matter from an ulcer. The termination is various.

TREATMENT.

The whole nervous system should be quieted as soon as possible. To effect this, the patient should be made to perspire freely, and should be kept quiet in bed. If not relieved immediately, give a thorough course of medicine, and the bath. A tea, made of witch hazel leaves, red raspberry leaves, or the American tea, so called, would be of great service to remove the canker from the bowels; and the astringency of those articles would be highly favorable to check the disorder. One of the greatest things I have ever used to quiet the irratibility of the bowels, is to take of first quality Holland gin, one pint, good molasses one pint, and put them together, and add half an ounce of dyspepsy powders; shake them well together, and stop the preparation tight in a jug for use.

Take from a fourth to half a glass, and keep quiet in bed; an astonishing relief is thereby acquired. With this remedy alone I have relieved some violent cases of this complaint.

[*Regular Treatment.*—Mercury, bleeding, antimony, opium, nitric acid, catechu, and sulphate of iron.]

COLIC.—*Colica.*

Colic is distinguished by a griping, intermittent pain in the vicinity of the navel. It is often an attendant on costiveness and flatulency; but as a disease by itself, its cause is constriction of the bowels, which may be caused by crude, indigestible substances. The abuse of cathartics, application of too great cold to the body when heated, and many other ways by which the vital action is reduced.

TREATMENT.

Much the same as cholera morbus, by warming the stomach with composition and cayenne, and making use of an emetic, and, if necessary, a course of medicine.

[*Regular Treatment.*—Bleeding, mercury, jalap, opium, æther, ammonia, and tobacco.]

PAINTER'S COLIC.

This is distinguished from the common form of colic, by being caused by the absorption of lead into the system; by the pain being seated in the pit of the stomach, shooting thence in all directions, and sometimes extending as far as the extremities; by a great external soreness; and by nausea and vomiting on the second or third day after the attack. In an advanced stage of this disease, palsy of the upper extremities not unfrequently happens. It is often induced by sleeping in newly painted rooms, and by the inhalation of the oxyde of lead by those who are en-

gaded in mining or purifying the ore, and from the same cause by painters.

TREATMENT.

The same as colic, except that the person should use milk freely, mucilage made of slippery elm and other substances, to overcome as much as possible the deadly sickness at the stomach, occasioned by the dust or the paint, until the poison can be removed out of the body, which it frequently takes several days to do.

The person should take as little acid as possible during the paroxysms of this pain.

[*Regular Treatment.*—Bleeding, antimony, opium, mercury, tobacco and colocynth.]

LIVER COMPLAINT.—*Hepatitis.*

The symptoms of liver complaint are, chill and fever, pain in the right side, under the arches of the false ribs, accompanied with a sense of tenderness on pressure; the skin of a yellow, sallow appearance; clay-colored stools; a furrowed tongue, thirst and nausea. Some variety, however, is observed in the attending symptoms, caused by the seat of the inflammation. The suffering of the patient is greatest, when its seat is the surface of the organ. Chronic inflammation of the liver, generally, grows out of the acute, but often comes on insidiously. The pain is often, not severe or even absent; the digestion imperfect, the bowels costive, and most usually attended by some fever, of a remittent character.

TREATMENT.

This complaint should be treated by giving freely of the emetic pills for several days, and then taking a course of medicine. A stimulating plaster should be put upon the right side, directly over the lower lobe of the liver; also, one may be used to much advantage between the shoulders. The laxative pills may be freely used, to keep the bowels in order, and courses of medicine as often as necessary, to keep the circulation free and easy.

[*Regular Treatment.*—Blistering, bleeding, jalap, mercury, opium, antimony, colocynth, and nitric acid.]

INFLAMMATION OF THE KIDNEYS.—*Nephritis.*

This disease is marked by pain in one of the loins, shooting towards the bladder, vomiting, numbness of the affected side, desire to pass urine constantly, and retraction of the testicle. It is usually caused by obstructions of the ureter, but sometimes by violence.

TREATMENT.

A stimulating or sweating plaster may be applied to the back, directly over the kidneys. Bathing the feet in hot water, and then with liniment, to equalize the fluids of the body, will ease the distress, and relieve inflammation.

Take a handful of strawberry leaves and put them into a quart of soft water and steep them for five or ten minutes, and have this for a constant drink. This promotes the discharge of urine, and consequently relieves inflammation. The bath may be used to great advantage. Strawberry

leaves may also be used in gin, in form of tincture. The fruit is also good for this complaint. A tea made of parsley may be used to good advantage. At night, a hot stone may be placed at the back and one to the feet, to promote perspiration and ease distress.

[*Regular Treatment.*—Bleeding, opium, and jalap.]

JAUNDICE.—*Icterus.*

Jaundice is distinguished by the yellow hue of the skin, clay-colored appearance of the stool; by the urine tinging linen or paper yellow. It is brought on by imprudent diet, by drinking cold water when heated, or by excessive mental exertions. Fulness of the stomach and nausea are felt at its commencement. An increasing pain is felt in the vicinity of the liver, shooting towards the loins or the left shoulder. As the disease progresses, the urine often assumes a dark red color, like venous blood.

TREATMENT.

In this disease, at first a thorough course of medicine may be used to great advantage; after which a strong bitter may be made, as follows: one teaspoonful each of fine golden seal and poplar bark, with a little cayenne, put into a pint of hot water, sweetened. Take a glass three or four times a day. The dyspepsy powder may be used to great advantage—say half a teaspoonful in a little milk, hot water, cider or wine, or they may be eaten dry, half a teaspoonful at a time, when a faintness is felt at the stomach, which will be removed at once by its use.

Charcoal and milk has made some extraordinary cures of this complaint, which I am knowing to. Repeat the course if necessary.

[*Regular Treatment.*—Mercury, æther, jalap, ammonia, opium, mineral water, and electricity.]

GALL-STONES—*Calculi.*

Gall-stones are bodies of brown color, rounded, irregular shape, varying in size from that of a small hen's egg to minute particles. They usually occur in the gall bladder, but occasionally in the liver. They are most generally met with in persons of indolent habits, and in women more frequently than in men. Sometimes they occasion but very little disturbance, while at others they give rise to symptoms much resembling those of common colic. If violent pain occurs in the pit of the stomach, accompanied by sickness and vomiting, while the pulse remain natural, we may conclude there is a gall stone in the duct of the gall bladder. In the passage of the stone a severe pain is felt when it enters the canal, and when it passes into the cavity of the intestine.

TREATMENT.

The system should be kept under a continual relaxation from the free use of the tincture of the lobelia to facilitate the passage of the stones. A cold state of the system creates a contraction of the ducts, and the stone is thereby more rigidly confined to its position and of course is not as liable to pass as when stimulants are freely used and the system is made flexible by the vapor bath.

Where great distress is experienced a thorough course of medicine would be advisable, and the brown emetic should be used until the alarm-

ing symptoms are brought on, which will create a more general relaxation than any other course of treatment.

The bowels should be kept in good order, either by dieting, injections, figs, or castor oil taken in a cup of the prepared composition. This method of using oil does away with the injurious effects of the physic, and will have a tendency to relieve the bowels at any time and remove a confirmed constipation.

[*Regular Treatment.*—Mercury, jalap, rhubarb, juniper and opium.]

WORMS—*Vermes.*

The manner in which worms are generated in the human body remains as yet a matter of obscurity. The principal varieties of worms, are the long round worm, several kinds of tape worms, and the ascarides, or thread worm. The ascarides are found in the rectum, the others in the intestines and stomach. It is very difficult to decide as to the presence or absence of worms, unless they are voided by the patient. When a child under ten years of age presents a wasting of the body, gnawing pains in the stomach, pale countenance, irritation of the nostrils, fœtid breath, and disturbed sleep, we may suspect the presence of worms in the stomach. With the ascarides there is more evidence of local, and less of general derangement. Worms have been known to produce a cough.

TREATMENT.

The worms will never trouble when the digestion is good and the bowels are regular. A strong tea made of red raspberry, or witch hazel leaves, or sumach leaves and bobs, or all of them put together and sweetened, with the addition of half a pint of cherry stones or half a pound of peach meats well pulverized, and added to one gallon of the tea and well scalded in it. This makes an excellent syrup for children troubled with disordered bowels, worms, or when teething. It may be preserved by the addition of one quart of W. I. rum, and put into bottles for use. Take one-fourth of a glass three or four times a day, or a larger quantity may be used and oftener if necessary.

Ripe peaches are an excellent remedy, and the leaves made into a tea and freely used, is one of the best remedies that can be used for children that have disordered bowels. Garlicks and gin have been used with advanvantage and we think it an excellent remedy. Pulverize one ounce of garlick and put it into half a pint of good gin; give from a teaspoonful to a tablespoonful three or four times a day.

[*Regular Treatment.*—Mercury, jalap, cowage, aloes, filings of tin, and spirits of turpentine.

Diseases of Fibrous Tissue.

RHEUMATISM—*Rheumatismus.*

Acute or inflammatory rheumatism is distinguished by pain in one or more of the large joints, which is increased by motion or exposure to the weather. There is more or less pain in the adjacent muscles which is increased by action. They are swollen, and when compressed cause uneasiness.. In mild cases, although motion of the affected parts at first

causes pain, yet if continued the pain diminishes, and does not return till after a period of rest. This disease often shifts from one joint or part of the body to another. The surface of the parts affected is usually swollen, red and tender, especially the joints of the hands and feet. Those who have been once afflicted with it are liable to experience a recurrence of the disease, from very slight causes.

TREATMENT.

This disease I have often cured by bathing the feet until a perspiration starts over the body, then apply to the joints a poultice made as follows, viz:

Put two tablespoonsful of fine salt into half a pint of brewer's or baker's yeast, or of water, which should be hot; add one tablespoonful of brown emetic, two spoonsful of fine cayenne pepper; let these articles all be put into the water when it is hot, then add a teacupfull of soft soap, thicken with slippery elm and Indian meal or sponge crackers to the consistency of a poultice, apply this to the joints and keep them snug, and moisten when dry with water. Let these poultices be applied while the patient is in bed, and put a hot stone at the feet; keep up a perspiration, and relief will soon be obtained. If necessary carry the person through an active course of medicine.

In some cases the stimulating liniment will give immediate relief if applied to the joints, and flannel wrapped about them. In other cases apply stimulating plasters made of the common strengthening plaster and No. 2 or cayenne.

This is an excellent remedy to remove pain from the joints, back, sides, breast, or any other part of the exterior system.

[*Regular Treatment.*—Bleeding, blisters, nitre, æther, antimony, cantharides, opium, ammonia, turpentine, and sulphuric acid.

GOUT—*Podagra.*

The immediate seat of the gout is the joints of the extremities, especially of the feet. Its usual cause is a disordered state of the digestive organs. It commonly attacks people of an indolent mode of life, who are of a sanguine temperament, a full habit, and who are accustomed to eat rich and highly seasoned food. Its commencement is usually marked by pain in the ball of the great toe, and a general sense of chill; as the pain advances, the chill gives place to heat, and the usual symptoms of fever. The joint becomes much swollen, red and tense. The pain and inflammation continue, perhaps, for twenty-four hours, then terminate in a gentle perspiration; the paroxysm however usually comes on again in a short time, and after, in a few days, the disease may seem to have spent itself, and leave the patient spontaneously; but sometimes the fits continue longer, and the periods of relaxation are shorter, so that the affection becomes almost constant. In later stages of the disease, the lower extremities are cold, previous to the commencement of pain, which frequently shifts from one foot to the other, and then perhaps both are affected at once; and finally, the disease not unfrequently becomes nearly universal. In the mean time, the small joints of the fingers and toes become envolved in a whitish deposite, consisting of the acids of the urine combined with soda.

TREATMENT.

This complaint should be treated the same as inflammatory rheumatism,

and is generally relieved with as little trouble, unless it be a chronic case of long standing, when thorough baths and courses of medicine should be applied, with the soap and salt poultice upon the part affected, which generally produces immediate relief. In more recent stages, bathing the feet in hot water thoroughly, wipe dry, and apply the stimulating liniment, and let the patient take a teaspoon full of tincture of lobelia, half a dozen times a day, in spearmint, peppermint, or pennyroyal tea, this will produce the desired effect. Should the tincture operate as an emetic, use freely of the herb teas, and a constant improvement may be expected from this course. The diet may be light, and the bowels should be kept regular by the use of injections, and other loosening remedies.

[*Regular Treatment.*—Blisters, antimony, opium, cinchona, æther, ammonia, and carbonate of iron.]

ST. VITUS'S DANCE.—*Chorea Sancti Viti.*

The first symptoms of this disease are a changeable appetite, inactivity, hardness of the bowels, costiveness, and slight convulsive motions of the muscles of the face. It most usually attacks females, under the age of fifteen. The advanced stages of the disease are marked by affections of the muscles of the lower jaw, and of the extremities: the patient is often unable to walk steadily; and whatever part of the body he wishes to move, the muscles necessary to be called into action, either refuse to obey the will, or obey it imperfectly, and by jerks, in uncertain directions. Sometimes the speech becomes imperfect, the eye loses its brightness, and even loss of mental power seems to follow. The whole muscular system is never simultaneously affected, and in some instances, when one part is incontrolable, another part may remain perfectly natural.

TREATMENT.

This complaint is generally relieved by continued perspiration, keeping the bowels regular and the feet warm. A constant sickness or nasuea at the stomach should be kept up for several days, as well as a steady, gentle perspiration, in order that the rigidity of the muscles may give way, and a relaxation of the system follow; after which, brace up the system moderately and regularly, and each function will obey the power that has the control over it. A steady and determined course and perseverance should be pursued in such cases, if the practitioner would expect success.

Steaming and bathing the body and extremities with stimulants, and occasionally with a preparation of saleratus, tincture of emetic, and whiskey. A lively friction should be applied to the body, when the liniment or tincture is used. Dry friction, with a cloth or bare hand, may be used to advantage, two or three times a day.

It must always be remembered, that the object to be attained, is a relaxation of the muscles in the first place; and when about to strengthen, do it slowly, and give that tone and stability that is so much wanted by the deranged and disordered nervous and muscular systems.

[*Regular Treatment.*—Blistering, cupping, opium, purgatives, and cold applications.]

CONVULSIONS.

The symptoms common to all convulsions, are an irregular spasmodic action of some of the muscles, while others are forcibly contracted; an impaired sensibility; with a suspension of the power of utterance.

TREATMENT.

Give the patient tincture of nerve powder and asafœtada with the addition of a little cayenne or composition. This will most generally relieve. If not give from a teaspoonful to a tablespoonful of the third preparation, and put the feet into hot water. See that the bowels are in good order. This will generally answer the purpose and give relief.

[*Regular Treatment.*—Bleeding, blisters, zinc, musk, opium, and cold applications.]

EPILEPSY.—*Epilepsia.*

When attacked by epilepsy the patient suddenly looses all sense and power of motion; if standing he is immediately prostrated ; he is then seized by violent spasms, moving in different directions the limbs and trunk of his body. One side is commonly more affected than the other, the muscles of the eye are agitated, so that the lids open and shut continually or are stretched wide open, while the eyeballs roll in every direction. The mouth foams, the face is hideously distorted, and the tongue protrudes from the mouth. The muscular power is often enormously developed. These fits usually commence with a sudden scream, and terminate in sleep.

TREATMENT.

This disease should be treated with strong anti-spasmodics and nervines, and much the same as in the case of convulsions. I have had a number of cases of this complaint and of fits of various kinds, and have relieved the most of them. It was done by giving the third preparation and calling down from the upper extremities to the feet the excess of circulation, which would give ease to the brain, and the arterial and nervous system would become reduced and the patient find relief. In three fourths of all fits, spasms, cramps, convulsions, &c., the disease is brought on by an excessive circulation to the head and of course a proportionate deficiency at the feet; and when the fluids are equalized the patient finds immediate relief. To do which our most powerful stimulants, anti-spasmodics and nervines are brought into active operation in the third preparation, cayenne, nerve powders, and asafetida.

[*Regular Treatment.*—Bleeding, blisters, opium, æther, henbane, musk, iron, zinc, copper, mercury, and jalap.]

HYSTERICS.—*Hysteria.*

Hysterics usually occur in women over fifteen years of age. The fit commences with a severe pain in the head, coldness and shivering over the whole body, and a quick fluttering pulse. A slight pain is felt generally in the left side of the abdomen, from which place a ball seems to move with a grumbling noise, and after various evolutions, rises into the stomach and then into the throat, where it seems to remain for some time, and causes a sense of suffocation; then succeed stupor, insensibility and convulsions.

Sometimes the patient laughs and cries in the same breath; beats her

breasts and shrieks, although not entirely deprived of consciousness. After continuing for an indefinite length of time, the fits are either succeeded by a lethargic sleep, or leave the patient in a state of entire consciousness.

TREATMENT.

This disease may be removed by equalizing the circulation of the body by a thorough course of medicine, after the use for a few days of composition and nerve powder, and bathing the feet with liniment, and the face head and hands in cold vinegar or with cold water mixed with the spirits of camphor. Injections will be found useful when the bowels are disordered. Also, female injections may be used of witch hazel or red raspberry leaves, made into a tea with the use of nerve powder, cayenne, and emetic.

A tea may be made for constant drink from motherwort, (*leonurus cardiaca*,) which will be very useful.

A pill occasionally may be used of the size of a small pea, made from asafetida; this will expel the wind and quiet the nerves at times very much, and allow the patient to find rest at night. We have personally experienced the happiest effects from the use of this article in times of great nervous excitement.

[*Regular Treatment*—Bleeding, blistering, ammonia, carbonate of iron, opium, musk, and camphor.]

CATALEPSY OR TRANCE.—*Catalepsis.*

The symptoms which distinguish catalepsy, are absence of voluntary motion, while the breathing and pulse continue; the patient remaining in the same position in which they happen to be taken until removed, and then remain as they are placed. The fit commences without warning, lasting from a few minutes to one, two, or more days, and usually terminates with sighing. In some cases the breathing and pulse are so feeble, that the patient is liable to be taken for dead. It usually attacks females of a nervous temperament.

TREATMENT.

The feet may be bathed in hot water until the absorbents have taken up as much of the heat as possible to place the nervous and arterial systems in a state ready to become more active if possible. Then apply light shocks from a galvanic battery, or of electricity, and increase the power as the patient can bear. If that does not answer, give if possible a thorough course of medicine, and change the seat of action from the head to the feet.

[*Regular Treatment*.—Bleeding, blisters, cathartics, etc.]

APOPLEXY.—*Apoplexia.*

Apoplexy usually attacks persons of a short neck, large head and a corpulent habit, who unite great mental exertion to bodily inactivity. It does not often occur till advanced life, and most often to those who make a too free use of intoxicating liquors. Its general symptoms are a sudden loss of sense and motion, slow pulse, and breathing, attended with a snoring sound.

This is generally brought about by excessive pressure to the head

from over excitement. Those most liable to be afflicted are orators, statesmen, members of the bar, or clergymen. They are often cut down when speaking. It is brought on by a gradual loss of vitality, which is thrown off by rarefaction of excessive respiration, which exhausts the regular amount of vitality used in ordinrry business. But over excitement in an orator requires an over exertion in point of argument and language to convey to the auditors in the most forcible manner his sentiments. When the lungs have exhausted in a measure the quantity of warmth to keep them in motion, a supply is called in from the extremitities to make up the deficiency, and this in its turn is again used in rarifaction and is again thrown off. In calling in the heat in this manner the blood is also called in, and so it continues until the bloodvessels in the head are crowded to an excessive degree, the face turns purple, the organs of sense become over crowded, and vertigo is the consequence of dethroning the reasoning faculties, the man reels and falls almost senseless and lifeless.

By starting the blood in the arm a temporary vacuum is created and the pressure upon the brain is not quite as severe. But this temporary relief is soon overcome by the cold or absence of heat holding the power in the body. The eyes are blood shot, the countenance purple, having the appearance of strangulation or drowning. So close is the compression of blood in the region of the heart, brain, and lungs, that the feet and legs exhibit signs of immediate dissolution, by a cold, death-like, clammy sweat, and the skin appears shrunk and shriveled. To restore the blood back to the lower, and relieve the pressure upon the upper or superior extremities or organs, is what we wish to effect.

TREATMENT.

In the first place give a dose of cayenne or composition as strong as possible, then put the feet into as hot water as can be borne by the attendant, and continue to rub them thoroughly, and as soon as respiration becomes more easy, give warm mint tea sweetened with sugar and milk, and an injection made very stimulating with cayenne and active as an emetic by a free use of the third preparation, and make it produce vomiting if possible.

This will change the scene of excitement from the head to the opposite extremity; put a steam stone or brick at the feet and frequently bathe the hands and temples with cold vinegar or water. This will also have a tendency to remove in a measure the unnatural excitement from the head and give ease to the blood vessels in the region of the brain.

If the bowels require action, a couple of table spoonsful of castor oil in a dose of composition or cayenne tea will have the most happy effect. Let the diet for a day or two be thin gruel or toast water sweetened with sugar, with the addition of milk: also, soups may be used.

[*Regular Treatment.*—Bleeding, blisters, antimony, zinc, jalap and mercury.]

PALSY.—*Paralysis*

Palsy sometimes originates from exposure to the sun, drinking cold water when heated, repelled eruptions, or perhaps more frequently from apoplexy. The attack of itself is sudden, though it may have been preceded by pain in the head, difficulty of moving the tongue, and loss of perception and memory. Palsy is frequently local, and in such cases

often attacks the left side. This disease is characterized by a loss of life and the power of motion in the affected part.

There are but few that recover entirely from this difficulty, as it is generally brought on by old age, or in younger persons from overdoing the natural tone of the system by some species of intemperance, either in eating, drinking, exposure to the cold, or to the heat of the sun; or it may be produced by excessive bleeding and taking calomel, and thereby deadening the natural functions of the body, and causing the small balance of active fluids to press heavily upon the brain by which means an over distension of the blood vessels take place in the upper part of the body, and a degree of numbness or paralysis in the extremities for the want of circulation is the consequence, by which means the nervous and arterial systems become so much deadened to the sense of feeling that the numbness is experienced in the head, face, and on one side of the body, from its tracing the nerves from the seat of the disease into the live and active flesh.

TREATMENT.

Bathing and active friction will produce temporary relief in many cases. Sometimes patients have become nearly restored to health by courses of medicine. But in most cases where this disorder has once attacked the body and the patient recovered to tolerable health, the effect is manifest to an observer in the appearance of the person, countenance, or in the walk.

We think it seldom the case that persons entirely recover from this complaint when once attacked. Powerful courses of medicine may be applied, putting the emetic very strong into the injections, and let the patient take lightly of the tincture. At the same time bathe the feet with the third preparation and wrap them with wet cloths, keeping a hot steam stone at the feet. Take 6 or 8 cayenne pepper pods two or three times a day.

[*Regular Treatment.*—Bleeding, blisters, cantharides, ammonia, nitrate of silver, mercury and turpentine.]

Prominent Symptoms and Accidents.

CELLULAR DROPSY.—*Anasarca.*

This form of dropsy usually appears in the lower limbs, marked by cold diffused swelling, which on being pressed leaves the impression for a considerable time. Its progress is slow, first being observed about the feet or ancles, and is diminished during the night, or when in a recumbent posture. As the disease advances it ascends, sometimes even reaching the face, which becomes pale and bloated. If the disease continues, the skin of the legs may give way, and the fluid ooze out in drops.

TREATMENT.

This disease may be successfully treated by the common courses of medicine. While under the course, bathe the feet and legs in strong third preparation, rubbing on the grains thoroughly; then wrap them up in towels wet with cold water, and keep a lively steam stone at the feet during the operation of the medicine, and wet the cloth when it gets dry, keeping a constant sweat upon the feet.

I have known this course of treatment to take the swelling entirely from the feet and legs in one operation. I once had a patient so bad that the feet near the ankles cracked open, down the side of the foot, nearly three inches, and the water escaped from the orifice; the flesh turned black, and indicated the near approach of mortification. A course of medicine, with the above treatment (applying the third preparation, wet cloths, and steam stone at the feet,) removed not only the water, but the entire putrid appearance of the flesh.

The application of brewer's yeast, with cayenne and emetic, will have the same effect.

This method of treating the feet is most admirable also in its effects in cases of gout, inflammatory rheumatism, or any bruise or other disorder of the limbs, as it removes the pain immediately, if the patient is under the course of medicine.

[*Regular Treatment.*—Antimony, copper, mercury, jalap, gamboge juniper, ammonia, foxglove, æther, tobacco, and cantharides.]

WATER IN THE BRAIN.—*Hydrocephalus.*

This disease is seldom met with after the first seven years of life, although it has sometimes occurred to adults. Its first symptoms are, irritation generally, much similar to that produced by worms. A heaviness is felt in the head, accompanied by pain shooting from temple to temple; irregular fever; the eyes lose their brightness, the cheeks are pale; the pulse is irregular but quick; the head is hot, with severe pain in the forehead; and as the disease approaches a fatal termination, the patient screams suddenly, throws back the head, and is taken with delirium, vomiting, and convulsions.

The disease usually terminates in from three to six weeks after its commencement; yet it sometimes causes death in two or three days. The chronic form may continue even for years. This disease should be medically treated in its first stages, if possible,

TREATMENT.

This complaint originates from cold extremities, and want of suitable action in the bowels. The feet should be bathed (after taking some prepared composition) in as hot water as the patient can bear. This will measurably relieve the head. A gentle emetic of tincture may be used, and at the same time make use of an injection made of composition powders, or of red raspberry leaves, witch hazel leaves, or of the American tea; to which add the usual quantity of cayenne and nerve powder, and two tablespoonsful of the third preparation of the lobelia, well shaken, or one teaspoonful of the pulverized seed, scalded in the tea. When administered, let it be retained by the patient as long as possible. This will change the field of excitement from the upper to the lower extremities, and will in a great measure relieve the head, if the patient is not too far gone.

This injection will cause vomiting, by excitement in the bowels, and will most generally afford immediate relief.

This should always be remembered by pracitioners—to change the location of the excitement from the upper to the lower extremities, by this course, when there is any distress in the head, or the region of the lungs, either in the quinsy, croup, inflammatory sore throat, or asthma—remembering always to bathe the feet in the stimulating liniment, to keep the

excitement in the extremities, when once you have succeeded in your object.

When in bed, a hot stone should be placed at the feet.

[*Regular Treatment.*—Bleeding, mercury, jalap, gamboge, with electricity and cold applications.]

HEARTBURN.—*Limosis Cardialgica.*

Heartburn is a burning sensation at the pit of the stomach, accompanied by eructations of an acid fluid. It commences soon after eating, and the acid raised is doubtless generated during digestion. Its cause must be considered a derangement of the digestive organs.

TREATMENT.

A costive or relaxed state of the bowels will produce this complaint, and it is brought about by a deficiency of the gall to act upon the bowels.

It may be removed by using a lye made of hard wood ashes, and allowed to stand and purify; or clarified lime water, made of rock lime or oyster shell lime, may be used. Take of the clear lye or water from half to a tablespoonful, or if it be too strong reduce it by adding water. This will neutralize the acid. A strong bitter should be used immediately after, to restore the gall and powers of digestion. An emetic would be of service, to throw off the matter which has already remained too long in the stomach. This alkali may be used daily if necessary. Magnesia is an excellent remedy, especially with females in utero gestation.

[*Regular Treatment.*—Jalap, magnesia and ammonia.]

WATERBRASH.—*Pyrosis.*

Waterbrash is probably produced by the same causes which produce heartburn; and the eructations occurring when the stomach is empty, they being tasteless and in larger quantities, constitute the only material difference between the two diseases.

TREATMENT.

This is generally caused by the want of a suitable degree of animal warmth to throw off by perspiration the excess of moisture taken into the stomach. It may be removed by abstaining measurably from drink for a time, or by the use of strong stimulants, such as cayenne pepper, composition powders, &c., to throw out through the pores, by perspiration, that which is raised from the stomach for the want of a suitable quantity of animal warmth to rarify and dispose of it through the natural channels. Medicines should be used daily to restore digestion, as those powers are measurably affected by this complaint.

[*Regular Treatment.*—Mercury, antimony, colocynth, cinchona, and sulphuric acid.]

FLATULENCE.—*Limosis Flatus.*

This disease is produced by a weak stomach, and it consists in gas being formed from the food—principally carbonic acid gas—when under

the process of digestion, which cannot take place when the digestive organs are healthy. This gas is retained in the stomach, causing the abdomen to become swollen and hard; is eructed, or passed downward.

TREATMENT.

A little cayenne, ginger, or composition tea, will relieve. A tea made of the dyspepsia powder, or spearmint, peppermint, pennyroyal, sage, or of hemlock boughs, will remove it. The easiest remedy is, to take as much dyspepsy powder as can be held upon the point of a penknife, and it will relieve pain and expel wind from the stomach immediately. With children, a little hemlock, peppermint, or pennyroyal essence, put into warm water, sweetened, with a little milk, and given warm, will act like a charm; it will expel the wind, and put the child to sleep immediately.

[*Regular Treatment.*—Tartarized antimony, chalk, and opium.]

COSTIVENESS.—*Obstipatio.*

When the bowels do not move naturally, as often as once in twenty-four hours, we denominate it costiveness. Its immediate cause is, weakness of the bowels, and the strength of the gall not being sufficient to create action; which may be produced by excessive mental exertion, sedentary habits, inattention to regular evacuations, and a variety of other causes.

TREATMENT.

In this case the system should be regulated by a suitable diet—brown bread, crust coffee, milk porridge, or any other light food, while the digestive powers are being strengthened by bitters, to restore the gall sufficiently for it to act upon the bowels.

A small paper of the dyspepsy powders may be carried in the pocket, and used occasionally; about the fourth of a teaspoonful will remove the faint sinking sensation occasionally felt at the stomach.

Laxative pills may be used, made of equal parts of dried beef's gall, rheubarb, Castile soap, and bitter root, with the addition of one sixteenth part of cayenne, and pilled in the poplar or peach extract. Take from one to three at night. This is an excellent article for costiveness.

Or a pill may be made by drying down the tomato juice as thick as tar, and adding rheubarb, dried bitter root, and the cayenne, as before mentioned. Either of these is a good remedy.

[*Regular Treatment.*—Jalap, sulphate of magnesia, cassia, rhubarb, and mercury.]

INDIGESTION.—*Dyspepsia.*

This disease consists in the incapacity of the stomach to perform its natural functions. Its symptoms are, a faint sinking sensation through the system, especially in the morning; an oppression at the stomach after eating, which is often followed by a great desire to sleep; a heavy, dull pain about the head, a greater or less degree of emaciation, together with a long train of other symptoms, which the frequency of the disease at the present day renders it unnecessary to describe.

TREATMENT.

This complaint may be relieved by cleansing the stomach by emetics, and making a tea of the poplar bark, or by the use of the golden seal tea,

in which should be mingled a little cayenne. The feet and legs should be bathed in hot water, and thoroughly rubbed with the stimulating liniment. By continuing the friction at the feet, and regulating the bowels, the food will sit better upon the stomach and the patient will be relieved.

In extreme cases, courses of medicine must be resorted to, to clear the morbid matter from the system. A light diet should be used for some time, such as gruel, crust coffee, sweetened, with milk, and brown bread; or rye and Indian bread, soda crackers and milk, pudding and milk, sago, tapioca, will keep the bowels loose.

[*Regular Treatment.*—Mercury, jalap, aloes, rhubarb, soap, magnesia, cassia, cinchonia, iron, &c., with the use of vinous liquors.]

SPONTANEOUS VOMITING.

Spontaneous vomiting is often a salutary effort of the stomach to rid itself of offending matter. Morbid vomiting is sometimes occasioned by inflammation of the stomach; and some persons vomit on very slight occasions, and even with no apparent cause; and vomiting may continue on the administration of an emetic, after it has produced its ordinary effects.

TREATMENT.

This disease may be cured, by assisting nature to do what she seems struggling hard to perform. If there was nothing offensive upon the stomach, there would be no occasion for spontaneous vomiting. The best way, therefore, is to give an emetic, and rid the system of the offensive matter. Frequently, a dose of prepared composition powders will answer. A tea made of cayenne will frequently effect the object; but a more thorough emetic will be the most likely to answer the purpose, and is the surest course.

[*Regular Treatment.*—Bleeding, opium, and æther.]

HICCOUGH.—*Singultus.*

Hiccough has its seat in the diaphragm, and is a spasmodic affection of that organ, though its cause is usually an irritation of the stomach. It is frequently induced by flatulence and overloading the stomach. In itself it is never dangerous, but is in some diseases one of the surest signs of approaching dissolution.

TREATMENT.

A warm cup of mint tea will frequently relieve this complaint. We have known it to stop instantaneously by a sudden fright while the paroxysm was on, by some one going up unperceived, behind the person, and giving them a sudden blow, or speak sharp, as if in trouble. With the sick, anti-spasmodics should be used; such as asafetida, nerve powder, West India rum, Holland gin, &c., in small quantities.

[*Regular Treatment.*—Opium, æther, musk, sulphuric acid, blisters, and cold water.]

CRAMP.

Considered alone, cramp is never dangerous. It is most usually expe-

rienced in the feet and calves of the legs, though any part of the body is liable to be affected by it. It consists in a contraction of the muscles.

TREATMENT.

Lively friction, if in the limbs, will frequently remove the cramp. If more powerful means are required, take a little tincture of camphor, asafetida, or cayenne, after which bathe the feet, to cause a general glow to pass throughout the body.

[*Regular Treatment.*—Opium, æther, oil of amber, jalap, &c., with bleeding and electricity.]

BLEEDING FROM THE NOSE.—*Epistaxis.*

This often happens in catarrh, and may be induced by a pressure of blood to the head, and a variety of other causes.

TREATMENT.

This complaint may often be relieved by running, or violent exercise, to throw the blood into the feet. Putting the feet into hot water, and a cloth wet in cold water, applied to the temples, after taking a dose of warm medicine. If this does not relieve, and the patient is in danger, give an injection of composition, made strong with cayenne, and add, when the liquid is hot, two teaspoonsfull of the brown emetic, and a table-spoon full of the third preparation. Let this be given as warm as it can be borne. This will change the field of excitement to the lower extremities, and the vomiting will relieve the patient. A valuable astringent snuff may be made by pulverising witch-hazel leaves fine, and using it when bleeding.

[*Regular Treatment.*—Alum, zinc, lead, sulphuric acid, opium, and muriate of iron.]

STRANGUARY.—*Ischuria et Dysuria.*

Stranguary is a painful emission of urine, which usually flows only by drops, with a scalding sensation. Its cause is doubtless an inflammation of the neck of the bladder, which is most commonly induced by the application of cantharides, either internally or in the form of blisters. It has also in a few cases been produced by colds.

TREATMENT.

Get the system into a moderate perspiration, and apply a hot brick to the back, and use the diuretic remedies mentioned under the head of diuretics. If they do not relieve, take the course of medicine, and make a free use of a tea made of hemlock boughs, of strawberry leaves, or of wild lettuce, parsley roots, or the syrups directed to be made under the head of diuretics. A warm plaster may be applied to the small of the back, and the feet should be stimulated, to call down the circulation from the head, and create activity in the back and region of the kidneys.

The most simple way to remove this disease, is to heat several gallons of water to a boiling temperature, which pour into a large tub, then add cold water and reduce the heat to that point so that it can be borne by the patient with some inconvenience. Then let him take off his clothes and sit down into the water, which should come up above the navel, com-

pletely immersing the small of the back. Be covered with a blanket, to keep off the external air. This will relieve, in a few minutes, all distress occasioned by blisters, or from any other cause except calculus or the stone, and will then afford temporary relief.

[*Regular Treatment.*—Opium, æther, balsum copaiva, tobacco, mercury, and the use of the catheter.]

DIABETES.—*Saccharine Urine.*

This disease consists in an excessive discharge of urine. Its symptoms are, thirst, debility, a voracious appetite, a dry, harsh skin, a clammy tongue, and general debility.

TREATMENT.

The perspirable matter has turned in, and passes off by the urinary organs : this course must be stopped by creating an active circulation to the skin, and keeping it up at the same time by giving internally some of the most powerful astringents used in our practice, such as a tea made of white lily roots, witch-hazel leaves, or tincture of kino, made strong, of which take a tea-spoon full two or three times a day, unless it dries the mouth too much.

In the first stages, it may be cured by the free use of loaf sugar and rosin, one third of rosin to two thirds of loaf sugar, made fine—and a teaspoonfull used several times in course of the day. A tea may be made of avens-root, or cranes-bill, which will be sufficiently astringent to do much good in this disease. But the operation of a full course of medicine, and a continued perspiration for some time, with a free use of astringents, will answer the purpose. The bowels should be kept in good order.

[*Regular Treatment.*—Nitric acid, ammonia, bleeding, alum, zinc, and opium.]

GRAVEL.—*Lithiasis.*

Gravel is produced when the alkaline matter which the urine contains bears a too great proportion to its acid principle, to be kept in solution by it: in that case, the alkali becomes concreted, usually in the bladder. It may also be occasioned when the acid principle exceeds its due proportion in relation to the alkaline. In this case, the deposite is commonly made in the bladder, which appears in the form of red sand, but is concreted in the kidney, from whence it passes, and is deposited in the bladder.

Sometimes a nucleus is formed of these deposites in the bladder, which becomes solid, and attains a greater or less size, according to circumstances, and is then called stone.

TREATMENT.

Take two pounds of wild strawberry leaves and vines, and fruit, if to be had, and put them into a stone jug, and add two gallons of the best Holland gin, and half a pound of parsley roots, and quarter of a pound of juniper berries, all pulverised, and sweeten it with two pounds of boiled strained honey. Let this compound be well shaken together, and stopped down for use. Take from a quarter to half of a glass two or

three times a day. It is an excellent remedy. If the complaint is very distressing, a steam bath may be applied, and the patient having his feet in a pail of water, as hot as he can bear it, until the circulation in them is as free as in the hands. This will generally relieve; if not, the tincture of emetic may be taken to relax the system, and at the same time, all the drinks taken should be sweetened with clarified or boiled honey. A steaming stone or brick may be placed to the small of the back, as hot as can be tolerated, or cloths wet with hot water, applied as frequent as they become coolish, so that the heat can be increased and comfortably borne by the patient, may be used. Spirits of turpentine may be taken in small quantities, upon sugar, with much advantage, or mixed with boiled honey.

These are all simple means, to which people will generally have recourse before they will apply more thorough remedies. But if these things fail, (as it is seldom the case but some of them will relieve the patient,) then try the thorough course of medicine, applying the heat to the feet by hot water while in the bath, and bathe with liniment when out. A tea made of poplar bark may be constantly used, and much benefit will be derived: also hemlock boughs may be made into tea, and freely used for the same purpose, with advantage.

[*Regular Treatment.*—Opium, æther, turpentine, soda, lead, and alum.]

DROWNING.

When, by immersion in water, the animal functions become suspended, so as to cause death, we call it a case of drowning.

The reason why immersion in water causes death, is supposed to be the prevention of air from being inhaled into the lungs, and thus the blood is not changed from the properties of venous to arterial, but is passed from the left side of the heart to the brain in the venous state, in such quantities as to impair the vital power.

TREATMENT.

The raising of the temperature of the body should be as nearly natural as possible, that is, as natural and uniformly through the body. The heat may be raised to ninety-eight degrees of Fahrenheit, but not over one hundred. The body should be laid upon a mattress, between blankets, the head and shoulders elevated—the feet extending over the foot of the bed, and immersed in as hot water as the attendant can bear, in order that the absorbents may raise sufficient heat of vitality to cause respiration as soon as the lungs can be moved by suitable oscillations. The evidence of improvement, or returning life, may be noticed by the increase in the size of the veins in the hands and feet.

While the feet are in the water and the body is becoming warm, light shocks may be applied from a galvanic battery or of electricity, which will have a tendency to give that oscillating motion to the lungs so necessary in respiration. As soon as possible pour into the mouth one tea spoonful of the third preparation, to create an excitement at the roots of the tongue and glands of the throat, which will give action. If the patient begins to recover it will first be perceived by the pulse and then by respirations "few and far between." In this case the efforts should be redoubled to apply the shock of galvanism light or heavy as the circumstances of the case will warrant. Rub the feet and arms to increase the circulation. Do not suffer any thing to be put into the mouth that would

create strangulation with those that are well. Do not suffer any heavy weight to lay upon the breast as it will prevent the inflation of the lungs, so far as the weight is concerned. As soon as the patient can swallow, a sufficient quantity of the third preparation should be administered to create vomiting and thereby throw off all foreign matter from the stomach, as well as to excite perspiration, to quiet the nervous system, induce sleep and quietness, and restore the body to its accustomed vigor.

[*Regular Treatment.*—Inflation of the lungs by the bellows, rolling on barrels, friction, electricity, bleeding, with the use of stimulants.]

HYDROPHOBIA.—*Canine Madness.*

This disease usually arises from the introduction of poison into the system by the bite of a rabid animal, though perhaps in some cases it arises spontaneously. It commences with great anxiety, timidity, sighing, dryness of the tongue, a horrible sensation when attempting to swallow any kind of liquid, a small weak pulse, accompanied with slight fever. As it progresses, it is marked by continual watching, difficult respiration, abhorrence of light and the motion of the air, and frothing at the mouth; and the sufferer's life usually terminates in convulsions.

TREATMENT.

The patient should be got into an active perspiration, and the courses of medicine applied daily, and the tincture of emetic should be used freely at intervals until nausea is induced. Continue this course, keeping up a moisture upon the surface and a regularity of the bowels until all symptoms of the disease disappear.

Continued perspiration alone has cured canine madness in some cases; but this cannot be continued without the free use of strong counter-poisons, for which purpose use the lobelia in tincture or as an emetic, in the course of medicine, and in every other form in which it has been successfully employed in other complaints.

A number of cases of this disease have been cured by the Thomsonian practice after having been given up as incurable under the regular treatment, and having been exercised with the dreadful paroxysms incident to that complaint.

[*Regular Treatment.*—Copious bleedings, scarifying, copper, opium, ammonia, salts, cold bathing, and musk.]

VENEREAL DISEASE.—*Syphilis.*

Syphilitic poison being applied to a part which is soft or covered with a mucous membrane, or otherwise where a puncture of the skin exists, produces an ulceration or inflammation of the part to which it was communicated. This disease may remain local, or it may run into a constitutional affection. When local, it shows itself in form of inflamed ulcers, very sore and painful, unequally rigid, the edges prominent and of an ash color, and with a disposition to spread rapidly over the adjacent parts.

When constitutional, the fluids throughout the whole system are tainted, and other parts of the body besides the genital organs are liable to break out in obstinate ulcers, or a sort of scrofulous affection; and in this form of the disease, unless arrested by efficient medical treatment, it sooner or later proves fatal.

TREATMENT.

Courses of medicine should be used two or three times in the course of a week, and the tincture of lobelia taken at intervals, to keep the stomach sickened. The evacuation of the bowels should be regular and daily. This course will generally relieve all distress. Then make a wash of the lobelia and yellow lily root. This tea may also be used as injections for the penis or per ani with good success.

A poultice may be used for any syphilitic sores, compounded of the lobelia and yellow lily root tea, thickened with slippery elm and sponge crackers, or Indian meal. If these articles cannot be had, make use of brewer's or baker's yeast, and thicken it with the crackers and the elm, with the addition of the green emetic. This will draw out the virus and heal the sores. Keeping the body cool, and the stomach nauseated by the lobelia or bitter root, with the use of the compounds for poultices and injections, there will not be much difficulty with the patient.

[*Regular Treatment.*—Mercury, opium, salts, nitre, ammonia, balsam copaiva, lime water, light diet, and cool temperament.]

TIC DOULOUREUX.—*Neuralgia.*

This is a disorder that often occurs in this country. It attacks the cheek and upper jaw, is a painful affection of the nerves, and takes its name from its sudden and excruciating darts of pain. The distress is frequently most intolerable without the least apparent signs of any affection of the cheek, teeth, or jaw. It is oftentimes by unskilful physicians attributed to the teeth, and many have very injudiciously extracted all on that side; but it is never succeeded by any mitigation of the pain. It is therefore always commendable for those who have sound teeth in their head, to let them remain in such instances, as not the least possible benefit can be derived from their extraction.

TREATMENT.

We are seldom called upon to meet this disease. One case of it was treated by us the past year, it was that of a young lady who had been seriously afflicted with it for upwards of a year, so that at times she could take no rest day nor night. We commenced our treatment by giving her compositition, to create an action in the system, and bathing the feet with stimulating liniment, to take the pressure from the head. The second day she took the vapor bath, and afterwards four or five emetic pills daily, which sickened, and caused slight vomiting; then put a stimulating plaster upon the cheek, which counteracted the constringent effects the cold air would naturally produce while taking the warm medicine, besides relaxing the muscles so as to abate the pain. For four or five of the first days and nights she was constantly exercised with the most intense pain in that cheek. We then administered a full course of medicine, and followed up the bath every day, with bathing the feet and warm medicine internally, until the ninth day, when she returned home in the steam-boat, without the least pain, and has not since, we learn, been afflicted with the least symptoms of the tic douloureux.

We should not feel authorized to declare that the above course would cure every case of the complaint; but we know it was effectual in this instance, and this should be an inducement to make a trial of it in other cases.

N. B.—We have had several cases since the one above mentioned, and have generally been successful with them. J. T.

A VALUABLE SALVE,

For violent Inflammatory Sores, Burns, Canker or Fever Sores, &c.

Take of beef's gall, and dry it down to the consistence of salve, and apply it to the part affected, and it takes out the inflammation immediately, and prevents the contraction of the muscles.

This is a much better remedy for old sores than the black salve, in which is compounded the red lead, mentioned on page 734, and should be used in its stead.

[This article was overlooked, and not put in its proper place, but is too valuable to be entirely omitted.]

Cookery for the Sick.

After a satisfactory operation of medicine, the next most important subject to be attended to is the appetite. The food should be light, and such as to set well upon the stomach, for which purpose we have selected the following articles.

TO MAKE CHICKEN BROTH.

Dress a fowl; wash it in boiling water, with a portion of salt; take eight quarts of water, and four or six ounces of pearl barley; boil it an hour and a half; put in the fowl and boil it, with the addition of the white of leeks and parsley. When the fowl is sufficiently done, add a pint of sweet milk; let it just come to the boiling point; take the soup off the fire, have the fowl covered with a small quantity of good butter and parsley, with a few pieces of lemon peel. A little pepper and salt or aromatics may be added.

ANOTHER METHOD.

Take a chicken and cut it in pieces; put the gizzard in with it, opened and cleaned, but not peeled. Boil it till the meat drops from the bone. Begin to give the broth as soon as there is any strength in it; and when boiled, eat some of the meat. Let it be well seasoned. This may be given instead of milk porridge, and is very good for weak patients, particularly in cases of dysentery.

ANOTHER METHOD.

Put the body and legs of the fowl, after taking off the skin and rump, into the water it was boiled in, with one blade of mace, one slice of onion and ten white pepper corns. Simmer till the broth be of a pleasant flavor; if not water enough, add a little. Beat a quarter of an ounce of sweet almonds with a teaspoonful of water, fine; broil it in the broth; strain, and when cool remove the fat.

BEEF, MUTTON, AND VEAL BROTH.

Put two pounds of lean beef, one pound of scrag of veal, one pound of scrag of mutton, three ounces of pearl barley, sweet herbs, and ten pepper corns, into a nice tin sauce-pan, with seven quarts of water; to simmer to three or four quarts, and clear from the fat when cold. Add one onion, if approved, or the white part of leeks.

Soup and broth made of different meats are more supporting as well as better flavored. To remove the fat, take it off when cold, as clean as

possible; and if there be still any remaining, lay a bit of clean blotting or cap paper on the broth when in the basin, and it will take up every particle.

TO MAKE MILK PORRIDGE.

Put a quart of water in a kettle, with a proper quantity of salt, and while heating mix a gill of flour in a bowl with water, made thick, and when the water is boiling hot drop this into it with a spoon; let it be well boiled, then add half a pint of milk. This is to be eaten while under the operation of the medicine; and is also good food for the sick at any other time, especially when the stomach is weak.

ANOTHER METHOD.

Take of water gruel, when it has stood a little while to cool, and add half the quantity of unboiled new milk. It may be eaten salted or fresh.

Milk porridge is exceedingly cleansing, and easy of digestion, and may be given to the weakest stomach that is able to receive food.

WATER GRUEL.

Take a spoonful and a half or fresh ground oatmeal, mix with it gradually a quart of river or spring water, and set it on a clear fire. When it is rising or just ready to boil, take it off and pour it from one basin into another, backwards and forwards five or six times; then set it on the fire again till it is ready to boil, but before it does boil take it off and let it stand a little in the sauce-pan, that the coarse husks of the oatmeal may sink to the bottom. Then pour it out, add a little salt, and let it stand to cool.

When water gruel is made with grits it must boil gently for some time. The longer it boils the more it will jelly. But moderation must be observed in this respect, for if it be very long boiled and very thick it will be flat and heavy.

A mistaken idea very generally prevails, that water gruel is not nourishing. It is, on the contrary, a light, nourishing food, good either in sickness or health, both for young or old.

TOAST AND WATER.

Toast a thin piece of bread, at a distance from the fire, till very hard and brown, but not the least burnt; then put it into a jug of cold water, cover it close, and let it stand an hour before it is used. The water will be of a fine brown color if properly made.

This is of particular use in weak bowels, and by the addition of a small portion of brandy is a very proper drink when the bowels are disordered.

ORANGEADE OR LEMONADE.

When you have squeezed out the juice, pour boiling water on a little of the peel and cover it close. Boil sugar and water to a thin syrup, and skim it well. When thoroughly cold, mix the infusion, the syrup and juice, with as much more water as will make it a rich sherbet, and strain it through a jelly bag; or it may be made by squeezing the juice, straining it, and adding capillaire and water.

RICE MILK.

To four large spoonsful of whole rice, washed very clean in cold water, add a quart of new milk, and stew them very gently for three hours. Let it stand in a basin to cool before it is used.

GENERAL INDEX.

NOTICE.

The Anatomical Index not only refers to pages, but is also a complete and useful Dictionary, to explain all Anatomical Technicalities to which a reference is made. See page 485.

IMPORTANT NOTICE.

The following objections to the different articles and compounds in this book, were made by Dr. Samuel Thomson, after the work was printed. And in justice to him, and out of respect to his opinion, we insert them here, that every one may know that his opinion is not changed in relation to cathartics, and that what is said upon that subject is done on our own responsibility, and for which Dr. Thomson is not to be held responsible. The following are the objections, viz.

All cathartic medicine, of every kind ; also, the compounding of the black salve, on page 734 (for which we have inserted a substitute on page 823); borax for sore mouth, page 738; maple charcoal to prevent mortification, page 727 ; a paper saturated with salt petre, and burned, to relieve asthma, page 742; Peruvian bark to clean the teeth, page 740 ; poke root made into ointment for the piles, page 741 ; sulphate of zinc compounded in poultices for syphilitic ulcers, page 733 ; burnt alum for dysentery, page 726 ; tobacco ointment for salt rheum, page 713 ; gin to quiet nervous irritability, page 711; emetic pills, page 700 ; asafetida for hysteria, page 634 ; blood root for emetic, page 684 ; black cohosh to cure rheumatism, and to regulate the monthly turns with females, page 643 ; and, page 695, the injection should be given before steaming.

It is to be understood, that he objects to the use of those articles, in every form or shape whatever, except the enemas. JOHN THOMSON.

CORRESPONDENCE.

We subjoin the correspondence between his Honor the Mayor of the city of Albany, and the Rt. Hon. HORATIO GATES of Montreal, Lower Canada, in relation to our visit to that Province in time of the Cholera in 1832, and our treatment of that disease while at the latter place.

BOARD OF HEALTH,
CITY OF ALBANY, June 18th, 1832.

HORATIO GATES, ESQ.—The bearer, Dr. John Thomson, of this city, is desirous of proceeding to Canada, in order to attend some cases of cholera now existing in your city. I beg leave to commend him to your favorable consideration, and ask the favor that you will give him an Introduction to your Board of health, and such other authorities in your city, as may be thought advisable.
Respectfully Yours,
JOHN TOWNSEND, *Mayor of Albany.*

MONTREAL, June 23, 1832.

HON. JOHN TOWNSEND—Sir : Yours by the hand of Dr. John Thomson, (by whom this goes) was duly received, and I have to inform you that he has been very industrious while here in searching out cases of the cholera, most of which, however, were of a bad type, and had been too long neglected : He has prescribed to a number free of expense such medicines as he brought with him, which I understand he makes, and from the testimony of two or three individuals of respectable standing who accompanied Dr. Thompson, and saw him administer his medicine, together with my own personal observation, having conversed with two who are convalescent, and who described the relief obtained from Dr. Thomson's prescriptions as almost immediate and complete. I cannot but think good may result by his practice wherever that terrible disease, the Cholera, prevails ; yet as I have no knowledge of the science of medicine, my opinion must be taken for what it is worth.
Yours, HORATIO GATES.

OPINIONS

Of Medical Men and of the Press in relation to this Work,

AND THE

THOMSONIAN SYSTEM OF PRACTICE GENERALLY.

Extract of a letter from Professor BANKSTON, *Dean of the Southern Medical College, bearing date*

FORSYTH, Ga., August 14, 1841.

Dear Sir :—Yours of the 2nd has duly arrived and is now before me ; as also 632 pages of your new work, with plates, &c. ; all you mention.

It affords me much pleasure to see issuing from the press, a work under Doctor Thomson's sanction, of the appearance and character of the Thomsonian Materia Medica. Such a work has long been wanted, and the Thomsonian system has suffered much for the want of such an one. Its style is really genteel—such as the worth of the cause demands. The matter I consider well arranged, and is calculated to do credit to the writer and compiler. The theory I conceive to be good, and the articles of medicine, so far as I have seen, will meet the views of the large body of Thomsonians, or Botanics, if you please. The plates, both anatomical and botanical, are neatly executed, and cannot be complained of by any.

In a word, I entertain no doubt but more real benefit will result from it, than have from all other botanic works combined. In the first place, its appearance will command the attention of the first minds—sufficient, no doubt, to secure it a perusal—and its reasoning is such as to convince. I think it might profitably be extended even to one thousand pages, in giving the particular treatment of important diseases.

On the subject of evacuants you carry the thing as far as necessary, and none too far. Physiology sustains about your position on that subject ; and it will, I doubt not, remove the cause of that hair-breadth splitting, which has seemed to give you so much trouble at the North. As for active cathartics I have no use, but to excite some action upon the bowels is as necessary as upon the skin in many diseases ; and I have no doubt is oftener called for in this climate than in yours. To attempt to criticise I think would be rather a useless business, for what I might find fault with, would no doubt, please many others. I conceive the arrangement and style of the work as very good, and will give general satisfaction ; it carries upon its face the evidence of no small share of labor in so short a time.

Yours, L. BANKSTON.

To Doctor JOHN THOMSON, Albany.

From the Poughkeepsie Thomsonian, edited by Doctor Thomas Lapham.

THE NEW BOOK AT HAND.

We are informed that Doct. Thomson's new work is now ready for binding. It contains upwards of 800 pages, and 120 plates and cuts, which serve to illustrate in a familiar manner the structure of the human body, and a variety of medicinal plants, &c. The vegetable remedies are represented by colored engravings, which are neatly executed.

Many have been anxious to have this work completed, and at the same time some have almost dreaded its appearance, lest it should cause disturbance in the Thomsonian ranks. But we are happy to inform our readers that this publication will probably do more towards harmonizing the conflicting opinions which have prevailed for some time past, than all other things combined. We do not wish to be understood to say that Doctor Thomson's book is perfectly free from errors ; but we do believe that it will meet the approbation of Thomsonians generally in this state, and in the southern and western states. Both parties will probably rally under the influence of this production, and again acknowledge Doctor Thomson as their leader and benefactor. We cordially unite with Professor Bankston in the opinion that this book will take the lead of all botanical works, and do more good than all of them put together, in doing away with that hair-breadth splitting which has caused so much trouble at the North. We presume that Doctor Thomson will never have occasion to regret the time, money and labor spent in getting up this new publication. How could the old gentleman spend the evening of his life better, or more satisfactory to himself and the public, than by recording in a plain and familiar manner his experience in the art of healing for half a century ? The time will soon arrive when Doctor Thomson's labors will be appreciated by every son and daughter of America, and all, without a dissenting voice, will say " Well done, thou good and faithful servant," &c.

NOTE BY THE EDITOR OF THIS WORK.

We are under a compliment to Dr. A. Curtiss, Editor of the Botanico Medical Recorder, of Cincinnatti, Ohio, for a very flattering notice of this work, embracing upwards of two columns of his valuable and extensively useful paper. The article has been mislaid, which is our apology for its non-appearance at this time and place. Also to several other periodicals are we under a like indebtedness, among which are the Southern Botanical Medical Journal, published by the Trustees of the Medical College, Forsyth, Ga., Professor Lee, Editor ; the Botanic Sentinel, Philadelphia, Penn. ; the Thomsonian Manual, Boston, Mass. ; and the editors and proprietors of the other numerous daily and weekly publications who have had a fatherly care over, and have noticed and encouraged us, by their favorable opinion as we have progressed, has had its favorable influence, for which we return our grateful acknowledgements.

☞ And especially do we render our acknowledgements to the very TALENTED *editors and proprietors* of the BOSTON TRUE THOMSONIAN ; also, to the learned "PROFESSOR" !! of the ☞ BOSTON DISPENSARY, ☜ *Lecturer on Physiology, the Practice of Medicine, etc., etc.,* who have rendered signal service by their frequent notice of us, our venerable Parent and our Book as it has progressed, which has been peculiarly happy in its influence, in bringing it and us into notice so extensively throughout the United States.

J. T.

From the Boston Thomsonian Manual of October 1st, 1840.

It is with much pleasure that we lay before our readers the following letter from Benjamin Waterhouse, M. D., LL. D., Fellow of the American Academy af Arts and Sciences; of the Philosophical Society of Philadelphia, and of Bath and Manchester, England; Fellow of the Medical Society, London, of the Academy of Arts and Sciences, Belles Lettres, Inscriptions, and Commerce, Marseilles, and of the National Medical School of France, and late Professor of the Theory and Practice of Physic in the University of Cambridge, Mass.; which last high and responsible station he held for about THIRTY YEARS. We give his titles, because many of the *learned* faculty when told of his favorable views of Thomsonism, pretend that they have never heard of the man, and do not believe what is asserted. Dr. Waterhouse has been acquainted with the Thomsonian System for many years, and has given repeated testimonials in its favor. That many other eminent men and physicians would do likewise, had they the same *moral courage*, we do not doubt.

Cambridge, Sept 24, 1840.

Sir—To the inquiries respecting the System, or rather the Theory and practice of your Father, I reply, that had not its principles been founded in Truth and Nature, it could not have maintained its reputation thus far, but would long since have been swept into non-entity, and been numbered among those things which rise to-day, and are vanished to-morrow. Yet amidst opposition and even persecution, Dr. Samuel Thomson has the solid satisfaction of knowing that time has increased its reputation, and imparted firmness to a practice hitherto untried among us.

Thomson does not attempt to magnify himself by the arts of secrecy; but performs his curative process openly, and fairly appeals to his patient's feelings, and the judgment of his friends, to pronounce on the sick man's alteration for the better. The wonder with me has been that so many have been effectually relieved, with so little suffering.

The oldest practitioners, and physicians of the most extensive business, are the best judges of its success: For my part I know no victims to the process under consideration, when it has been judiciously and fairly conducted; and I confess that I have been rather surprised that so many have been relieved, who have long suffered under the hands of others.

As far as my knowledge extends, I consider Dr. Thomson well acquainted with chronic disorders generally; and without the aid of scholastic instruction, he has made his way, by the force of his own genius, and peculiar turn for the healing art, to the respectable stand he now occupies in the medical world; and without running into any invidious comparison between him and others, who are looking at the same object and traveling the same way, I pronounce him a *public benefactor*.

I remain with sentiments of respect and esteem, your steady friend.

BENJAMIN WATERHOUSE.

To Dr. John Thomson, Albany, N. Y.

Extract of a Letter dated Columbus Ohio, Dec. 31, 1832.

Dear Sir—Dr. Platt being in the office, I saw a letter he had written. Observing a vacant page, I thought I would place my pen to paper—for by the mouth of two or three witnesses shall every word be established.

I have been more than forty years engaged in the regular practice of medicine. I was a surgeon during the last war in the army of the United States. I was by an election surgeon (*extraordinary*) to the Petersburgh Volunteers and Major Stoddard's two companies of Artillery. I was one of the founders of the Western Medical Society of Pennsylvania, and also am a member of the Medical Society of the State of Ohio.

My practice has been extensive—my experience and opportunity for observation has seldom been exceeded: but I venture to pledge myself upon all I hold sacred in the profession, that in my estimation the discoveries made by your honored father, have a decided preference and stand unrivalled by all that bears the stamp of ancient or modern skill. The number of literary friends are continually on the increase. T. HERSEY.

To Doctor John Thomson, Albany.